

STUDENT NAME: A43145162
Version A

GROUP: C16

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- B** — ☐ a. The magma becoming colder
☒ b. Gas bubbles forming in the magma
☐ c. The surrounding crust becoming hotter
☐ d. Crystals forming in the magma

70

A — ☒ 2. Which of the following would be considered a negative feedback to increasing global temperature?

- Less ice = more energy absorbed**
☒ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
☐ b. Melting of permafrost resulting in more methane escaping into the atmosphere **more melting**
☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat
☐ d. An increase in desert formation resulting in more dusting blowing into the atmosphere

Less ice → increased temp = Neg. one ↓ one ↑

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- C** — ☐ a. A = erosion, B = deposition, C = uplift and erosion
☐ b. A = erosion, B = biochemical precipitation, C = uplift and deposition
☒ c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
☐ d. A = dissolution, B = deposition, C = uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- B** — ☐ a. ~~Human activities are the primary cause of the greenhouse effect.~~
☒ b. Natural processes are the primary cause of the greenhouse effect. —
☐ c. Human activities and natural processes are roughly equal causes of the greenhouse effect. —
☐ d. ~~Neither human activities nor natural processes are important causes of the greenhouse effect.~~
☐ e. ~~The human and natural causes of the greenhouse effect are not understood.~~

B — ☒ 5. Which of the following would cause the acidity of Earth's oceans to decrease?

- ☐ a. ~~An increase in ocean temperature due to an increase in atmospheric carbon dioxide.~~
☒ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash. —
☐ c. ~~A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.~~

6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- B** — ☐ a. Reservoir A has a shorter residence time than Reservoir B.
☒ b. Reservoir B has a shorter residence time than Reservoir A.
☐ c. Reservoir A and Reservoir B have equal residence times.
☐ d. More information about Reservoir A and Reservoir B is needed.

A **B**

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?

$$\frac{\text{input}}{\text{total}} = \frac{1000}{100} = 10$$

- a. The reservoir will eventually disappear.
b. The reservoir is not in equilibrium.
c. The reservoir is growing smaller.
d. The reservoir's residence time is 10 years.

8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
b. Reflection of more solar radiation, causing atmospheric temperature to increase
c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- a. The Earth's atmosphere would become colder than it is today.
b. The Earth's atmosphere would become warmer than it is today.
c. The Earth's atmosphere would remain about the same temperature as it is today.
d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

→ some industrial countries
are decreasing outputs,
some developing countries
are increasing outputs

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

The process by which oceans experience a change in pH causing acidification is as a result of increased CO_2 in the atmosphere. CO_2 in the atmosphere enters the hydrosphere through dissolution and further interacts w/ hydrogen forming ions which cause a decrease in pH in the ocean water. Increase CO_2 also increases atmos. which leads to warmer water and greater acidification.
negative feedback: CO_2 in hydrosphere leads to decrease pH in oceans

positive feedback: CO_2 increase in Atmosphere leads to CO_2 increase in hydrosphere

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

Increased volcanism would result in ash in the atmosphere which would block incoming solar radiation from the sun.

Greenhouse effect: Incoming solar radiation (mostly short wave visible light and some UV and IR) is absorbed by the earth's surface, transformed and ~~re refracted~~ into atmosphere. GHG's such as CO₂, methane, and water vapor absorb the longwave radiation and again refract back to earth. This allows our planet to maintain current habitable temperature.

Particles in the atmosphere such as clouds and volcanic ash prevent the radiation from reaching the earth to perform this process, which would cause measurable cooling.

20

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation = process by which H₂O enters the atmosphere (ocean → atmosphere)

Degassing = process by which CO₂ enters the atmosphere (volcanic → atmosphere)

Earn up to 1 additional point on your course grade

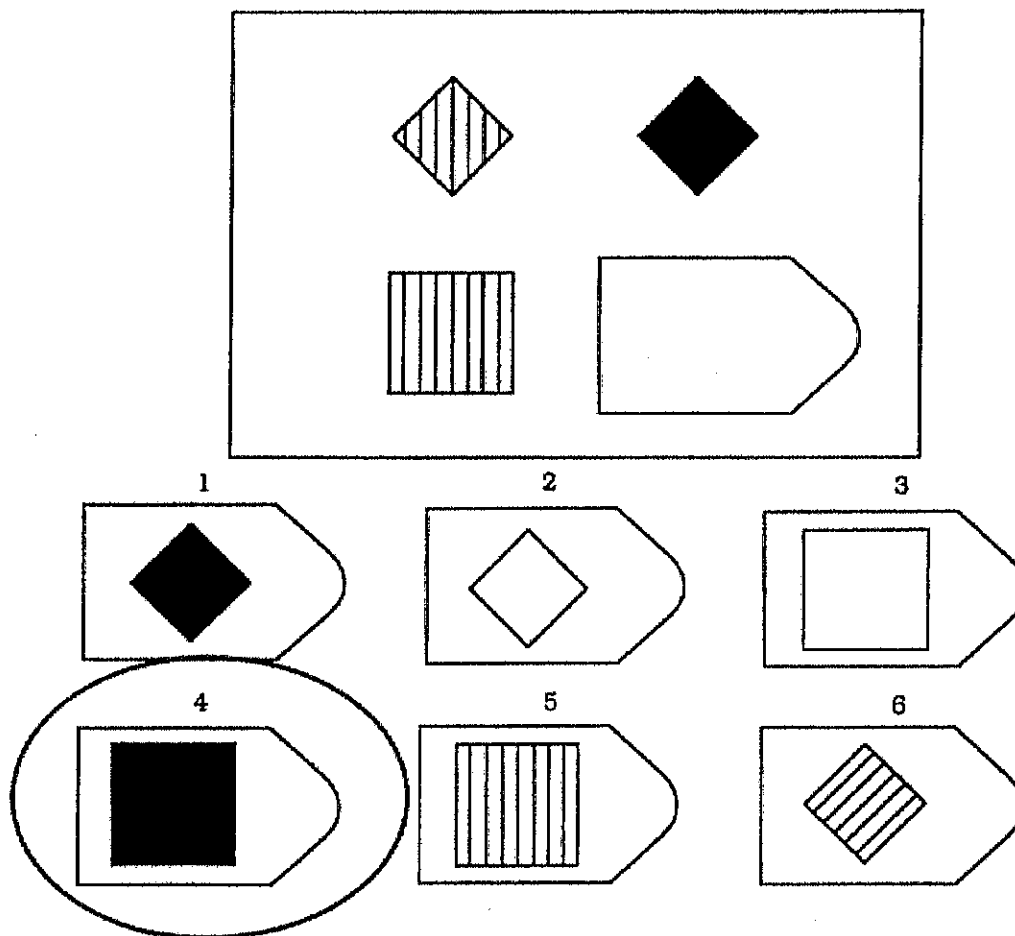
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

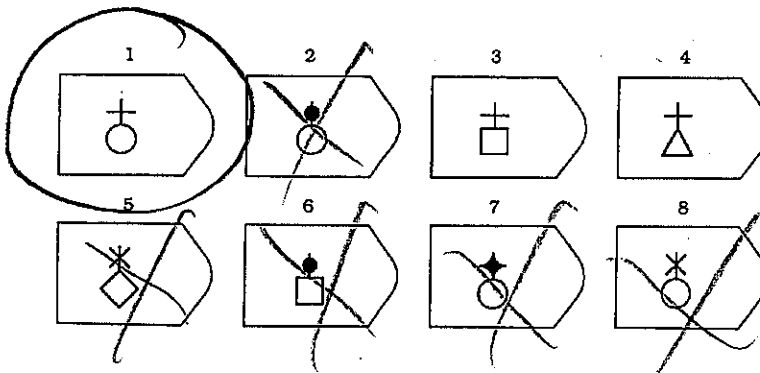
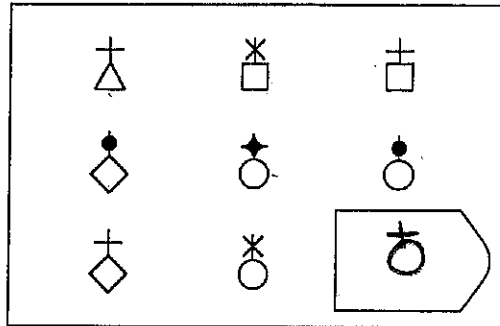


Answer: 4

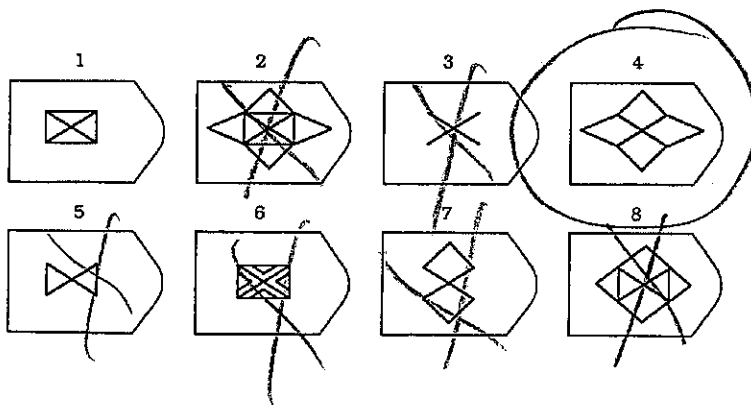
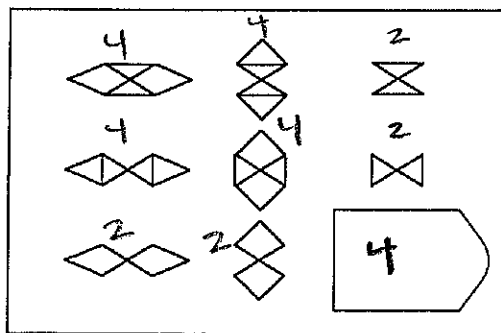
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Please choose the image that best completes each of the following patterns.

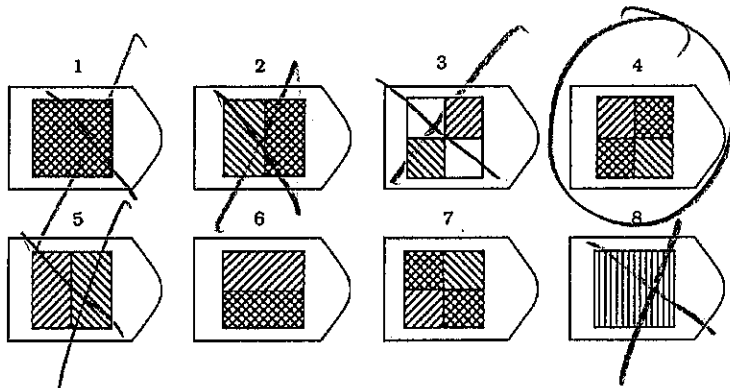
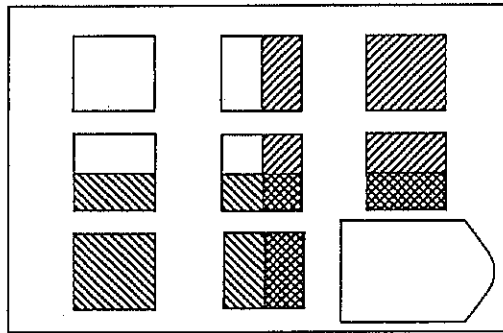
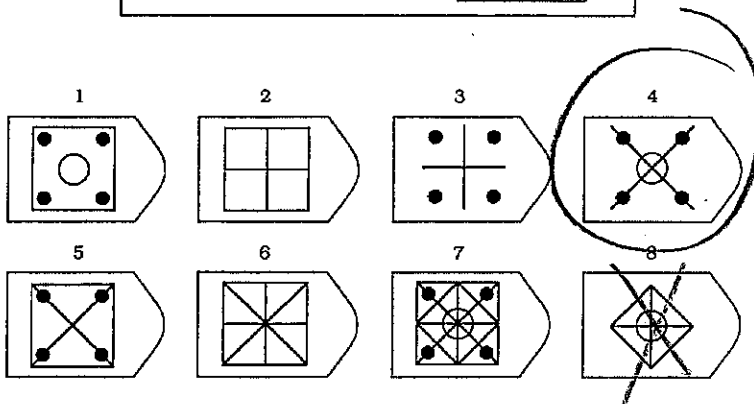
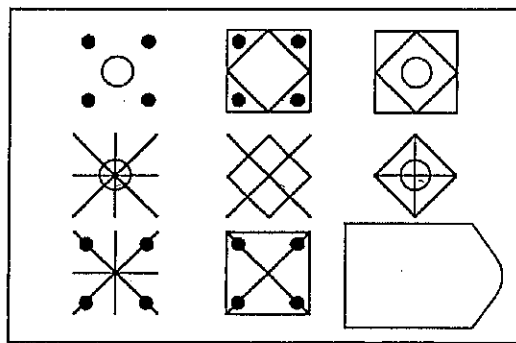
PATTERN 1



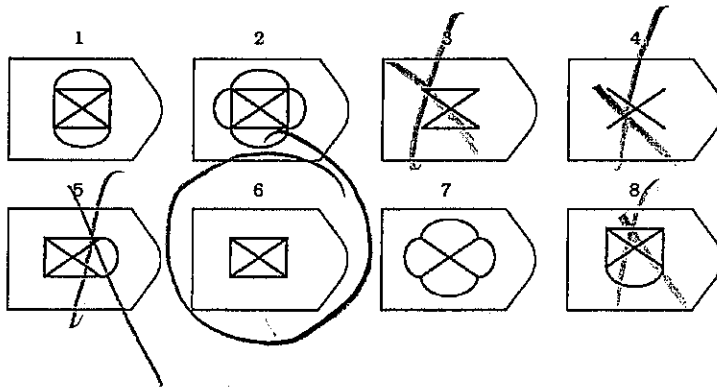
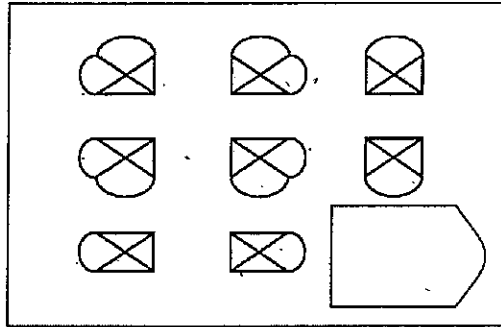
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

- A. ~~The experienced locksmith did not need much time to remove the padlock that no longer had a key.~~
- ☒ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
- C. ~~When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.~~
- D. ~~Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.~~

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
- B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet. *← Then she was doing it wrong.*
- C. ~~Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.~~
- ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

- ☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
- B. ~~Allison took her pedigree border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.~~
- C. ~~Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.~~
- D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

- A. ~~The toddler wrote on the walls with pens when the babysitter wasn't looking.~~
- B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
- ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
- D. ~~The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.~~

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. ~~The plumber fixed the pump that had burst and flooded the basement.~~
 - B. ~~Steven avoided midweek outings in order to have the time for a weekend trip out of town~~
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- B. A leaf in the air. They are similar because they both move through the air carried by the wind.
- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- ☒ A. Getting the flu. They are similar because they are both caused by viruses.
- B. ~~Getting pink eye.~~ They are similar because they are both contagious.
- C. ~~Getting the flu.~~ They are similar because they are both caused by not washing your hands.
- D. ~~Forgetting to do your homework.~~ They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 24 years

What is your home zip code? 48933

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☒ Caucasian
☐ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☐ Other

STUDENT NAME: A37497963
Version A

GROUP: C16

37

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
 - a. The magma becoming colder
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2. Which of the following would be considered a negative feedback to increasing global temperature?
 - a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
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3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
 - a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
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4. Which of the following statements about the greenhouse effect on Earth is most accurate?
 - a. Human activities are the primary cause of the greenhouse effect.
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 - D. ☒ d. The reservoir's residence time is 10 years.
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

If there was an increase in atmospheric carbon dioxide, the ocean temperature would increase. When the ocean temperature is increased there is less ocean acidification. This would be a negative feedback loop because the increase in atmospheric Carbon dioxide would cause a decrease in ocean acidification.

E

Q

5

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

If there was an increase in volcanoes that erupt large ash clouds, there would be an increase of ash in the atmosphere, which would not let in as much sunlight into the atmosphere. This decrease in infrared light coming in would mean there is less light to be reflected off the surface^{and} into absorbed into the atmosphere meaning the overall temperature would decrease.

2 5

- 2 Extra credit (2 points).
How are evaporation and degassing similar and/or different?

Evaporation is liquid changing to gas, and degassing is gas entering the air.

Earn up to 1 additional point on your course grade

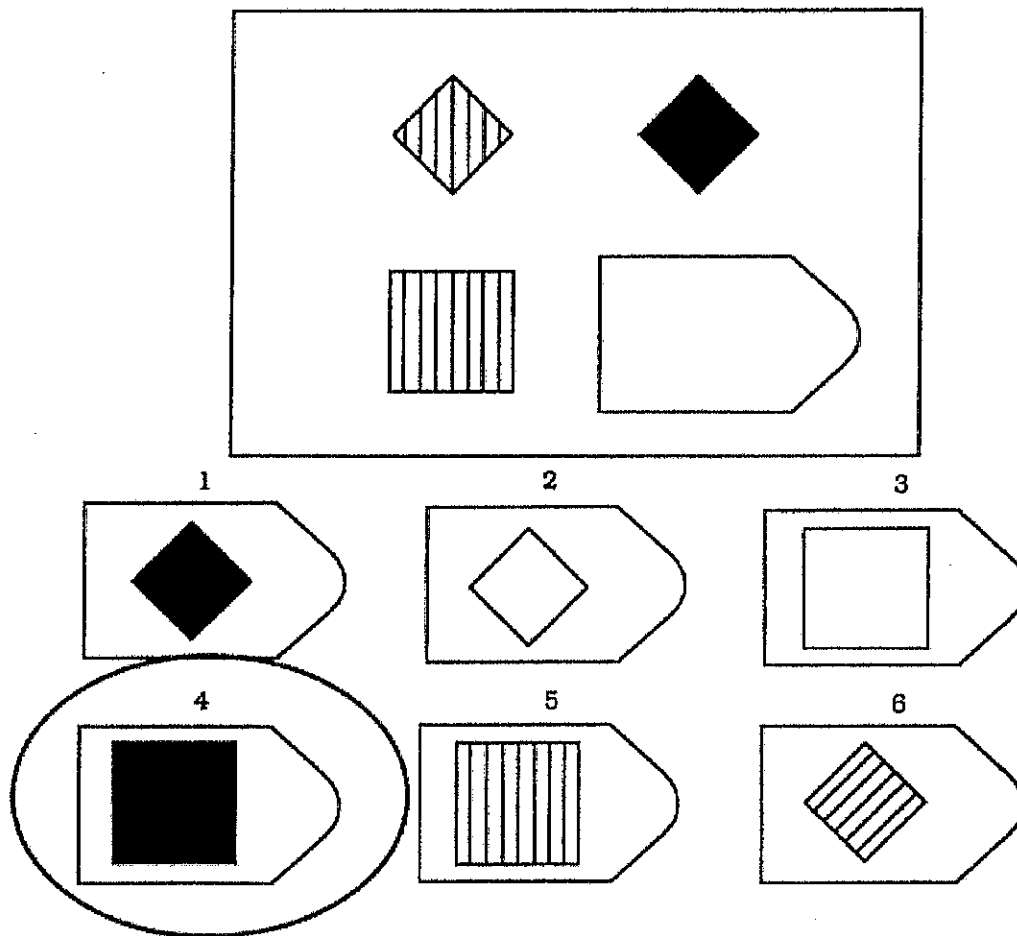
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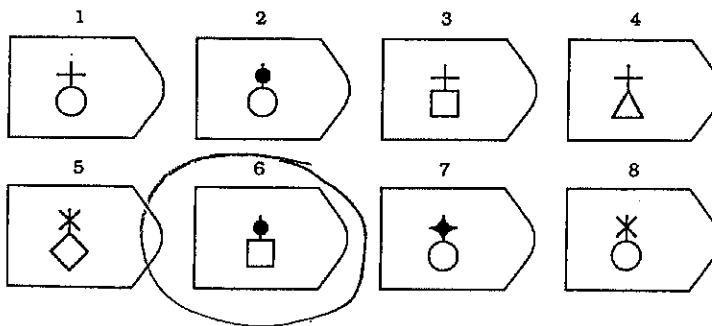
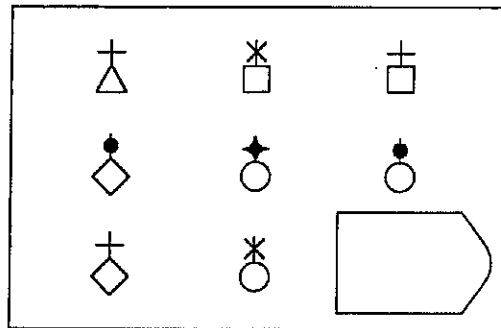


Answer: 4

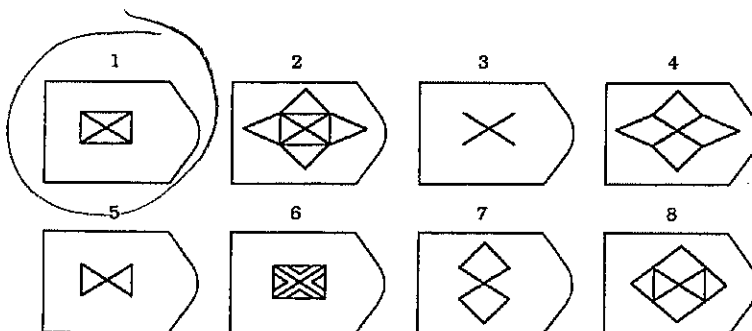
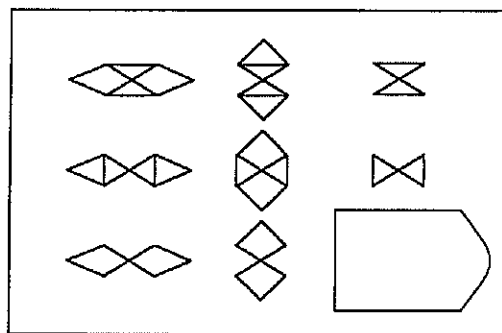
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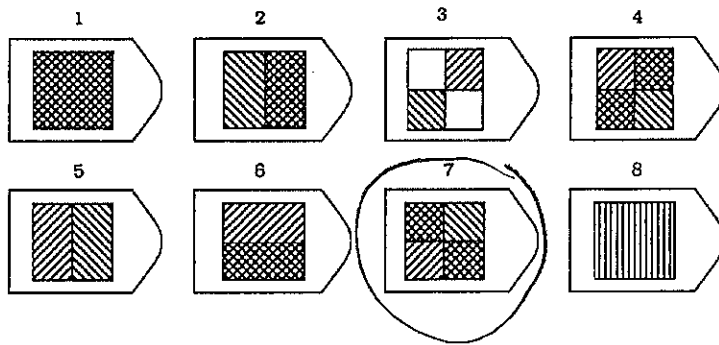
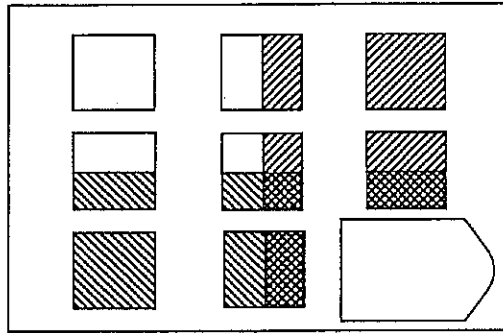
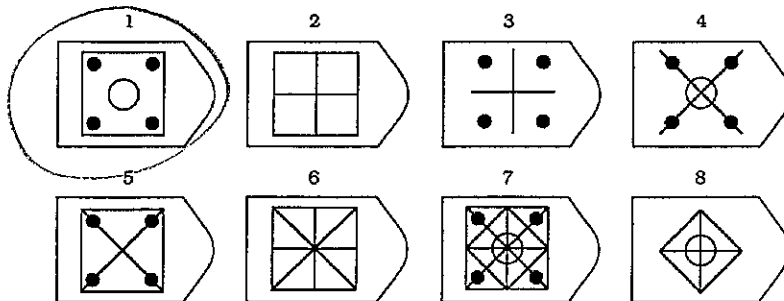
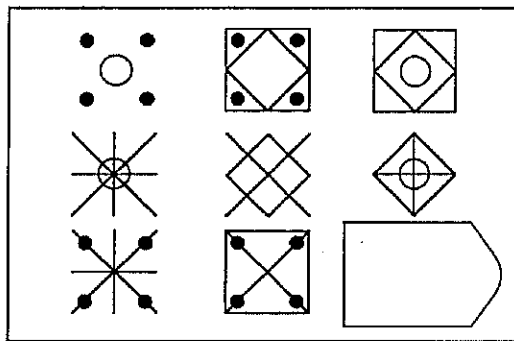
PATTERN 1



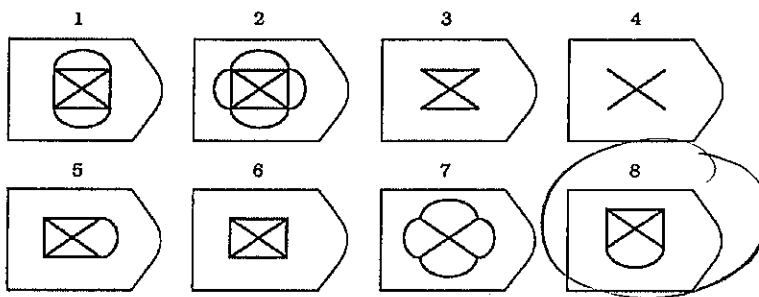
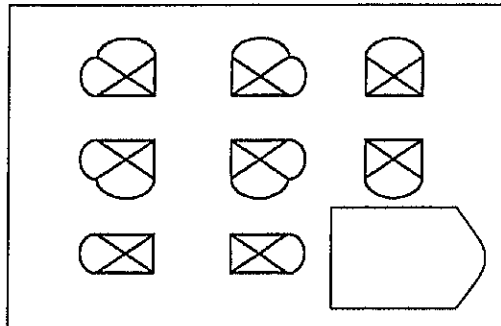
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

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2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
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PLEASE CONTINUE ON NEXT PAGE

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2. Catching a cold is like...

- A. Getting the flu. They are similar because they are both caused by viruses.
- ☒ B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 23 years

What is your home zip code? 487058

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☒ Caucasian
☐ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☐ Other

STUDENT NAME: A41944159
Version A

GROUP: C16

MULTIPLE-CHOICE. 5 points each (50 points total).

76

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- a. The magma becoming colder *density ↑*
- ☒ b. Gas bubbles forming in the magma *empt*
- c. The surrounding crust becoming hotter *viscs*
- d. Crystals forming in the magma

2. Which of the following would be considered a negative feedback to increasing global temperature?

- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
- b. Melting of permafrost resulting in more methane escaping into the atmosphere
- ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
- d. An increase in desert formation resulting in more dusting blowing into the atmosphere

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- a. A= erosion, B= deposition, C= uplift and erosion
- b. A = erosion, B= biochemical precipitation, C= uplift and deposition
- ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
- d. A = dissolution, B= deposition, C= uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- a. Human activities are the primary cause of the greenhouse effect.
- b. Natural processes are the primary cause of the greenhouse effect.
- ☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
- d. Neither human activities nor natural processes are important causes of the greenhouse effect.
- e. The human and natural causes of the greenhouse effect are not understood.

5. Which of the following would cause the acidity of Earth's oceans to decrease?

- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
- b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
- c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- a. Reservoir A has a shorter residence time than Reservoir B.
- ☒ b. Reservoir B has a shorter residence time than Reservoir A.
- c. Reservoir A and Reservoir B have equal residence times.
- d. More information about Reservoir A and Reservoir B is needed.

*influx & outflow
are equal to each other*

Res A has the same inflow & outflow as Res B

- (B) 7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - (b) The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
- (A) 8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation? *albedo effect*
- (a) Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- (B) 9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - (b) More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
- (D) 10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - (d) The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

↑ ocean acidification

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

• If there was an increase in atmospheric carbon dioxide there would also be an increase ocean carbon dioxide levels. This increase in carbon dioxide would cause an increase of the pH of the ocean which would show increased ocean acidification. ✓

• Positive feedback: The more CO_2 there is in the atmosphere the more CO_2 there will be in the oceans. As a result of increased ocean acidification even more CO_2 would be released into the atmosphere and the cycle would continue.

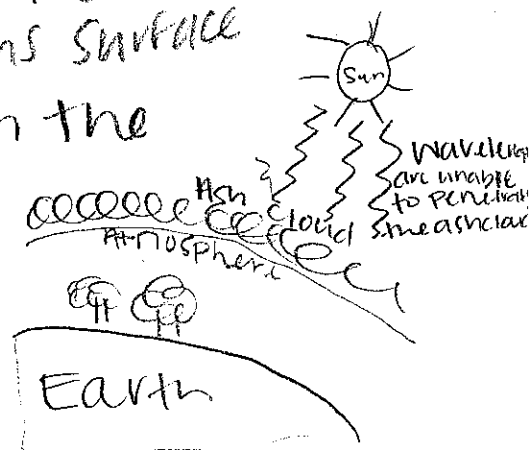
• Negative feedback: This is what keeps the system at equilibrium. The increase in ocean acidity would cause an increase in ocean temperature. Warmer temperatures can support and counteract the added CO_2 ?

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

An increase of volcanism on earth with volcanoes that erupt large ash clouds would increase the amount of ash in the atmosphere. This increase in ash would block incoming solar radiation. This lack of permeable radiation would have a large impact on the greenhouse effect. With visible light from the sun unable to penetrate the ash clouds the light will be unable to be absorbed by the earth's surfaces. Because there is no visible light being absorbed there is no infrared light being emitted. This infrared light is what heats the atmosphere and when it isn't there to be re-emitted back to earth's surface there will be a decrease in the atmospheric temperature. \rightarrow $\Delta P!$



Extra credit (2 points).
How are evaporation and degassing similar and/or different?

Evaporation and degassing are similar because they are both becoming a vapor. However, they are different because evaporation goes from a liquid to a vapor.

Earn up to 1 additional point on your course grade

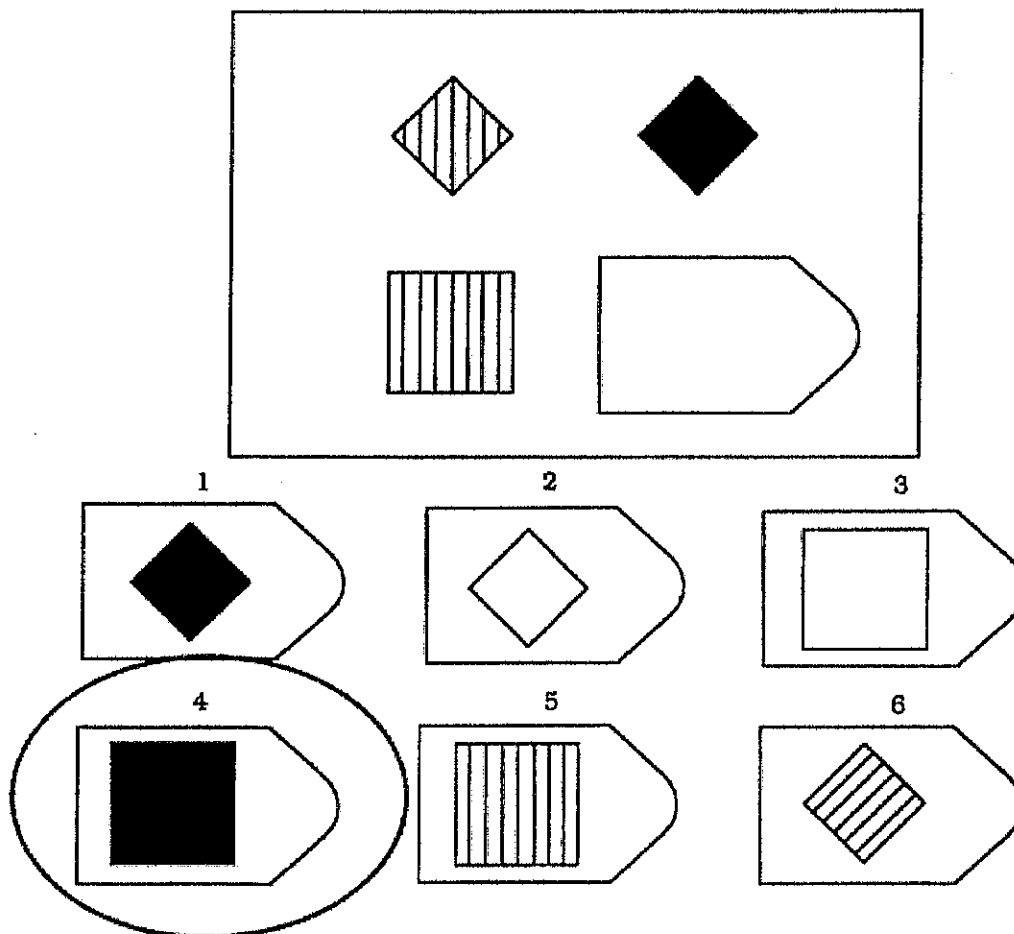
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

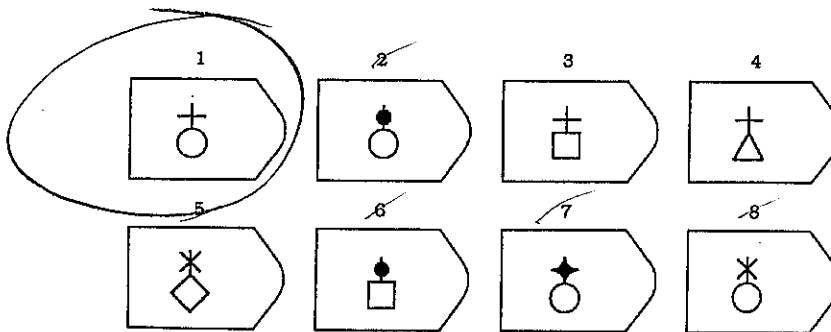
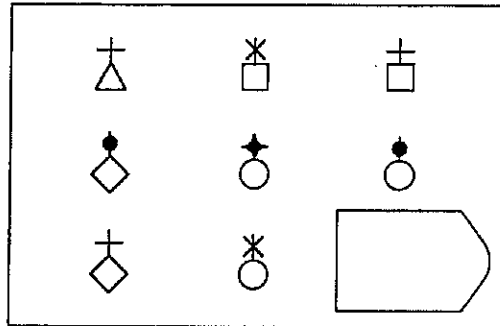


Answer: 4

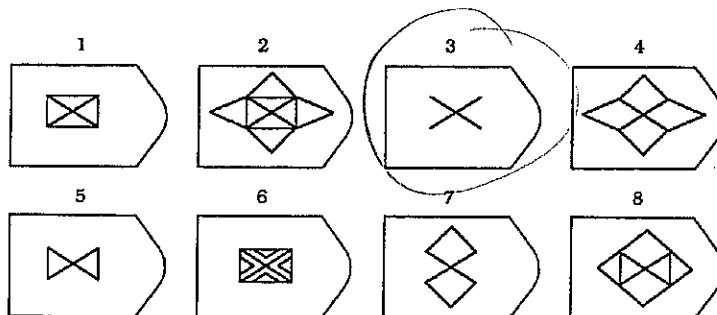
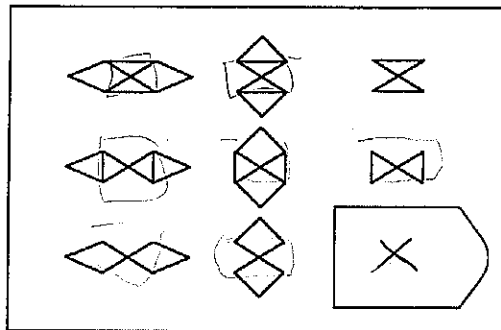
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

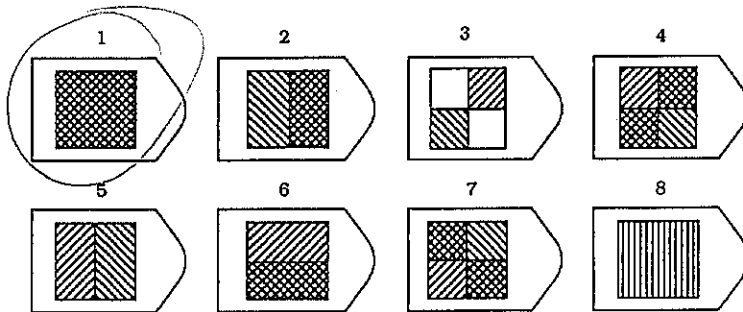
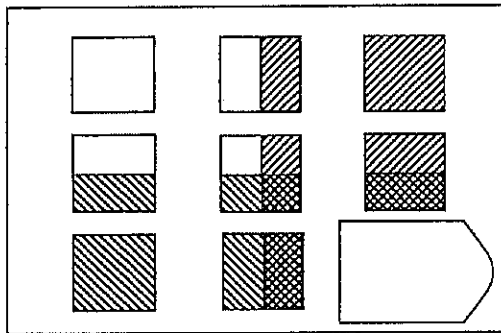
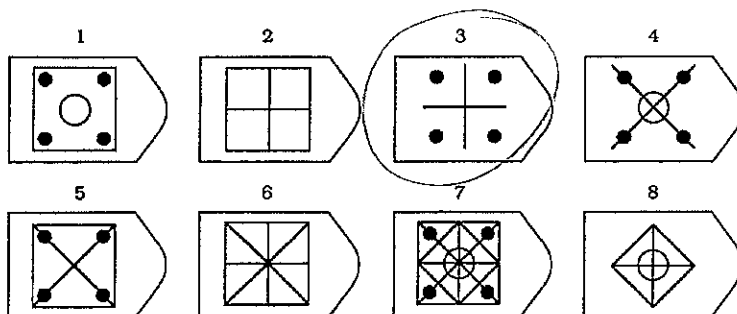
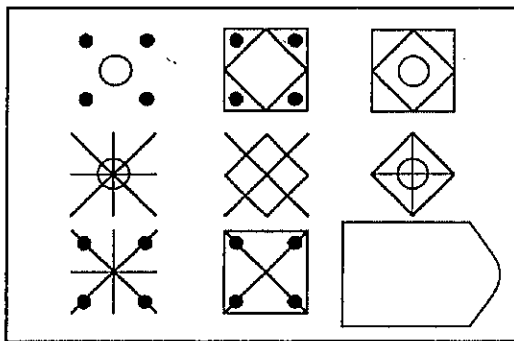
PATTERN 1



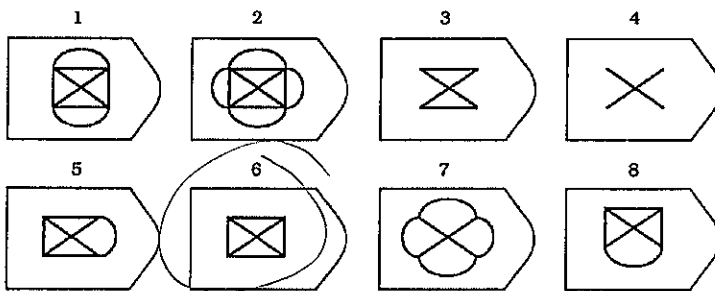
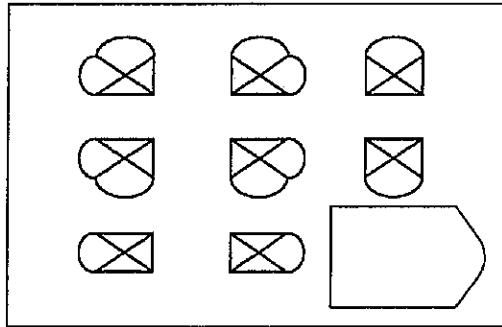
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

- ☐ A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.
- ☒ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
- ☐ C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
- ☐ D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- ☐ A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
- ☐ B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
- ☐ C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
- ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

- ☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
- ☐ B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
- ☐ C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
- ☐ D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

- ☐ A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
- ☐ B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
- ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
- ☐ D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...
- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
 - ☐ B. A leaf in the air. They are similar because they both move through the air carried by the wind.
 - ☐ C. Blowing bubbles. They are similar because they both float until they eventually pop.
 - ☐ D. A cloud in the sky. They are similar because they both float and are carried by the wind.
2. Catching a cold is like...
- A. Getting the flu. They are similar because they are both caused by viruses.
 - B. Getting pink eye. They are similar because they are both contagious.
 - C. Getting the flu. They are similar because they are both caused by not washing your hands.
 - D. Forgetting to do your homework. They are similar because they are both preventable.
 - ☒ E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 49684

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☒ Caucasian
☐ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A41727610

GROUP: C17

Version B

** I was at your office hours before the exam*
MULTIPLE-CHOICE. 5 points each (50 points total). *(I was wearing the Ireland shirt)*

- C 1. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere

- B 2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma

- D 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- a. A= erosion, B= deposition, C= uplift and erosion
- b. A= erosion, B= biochemical precipitation, C= uplift and deposition
- c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
- d. A= dissolution, B= deposition, C= uplift and deposition

- A 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.

- B 5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

- C 6. Which of the following would cause the acidity of Earth's oceans to decrease?
- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

B 7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- a. The reservoir will eventually disappear.
- ☒ b. The reservoir is not in equilibrium.
- c. The reservoir is growing smaller.
- d. The reservoir's residence time is 10 years.

$$r = \frac{S}{F}$$

$$r = \frac{1000}{50} = 20$$

A 8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- ☒ a. The Earth's atmosphere would become colder than it is today.
- b. The Earth's atmosphere would become warmer than it is today.
- c. The Earth's atmosphere would remain about the same temperature as it is today.
- d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

B 9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- ☒ b. Reflection of more solar radiation, causing atmospheric temperature to increase
- c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
- d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

C 10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

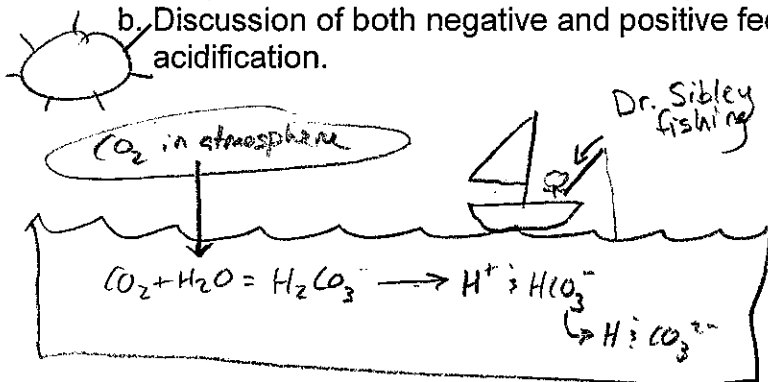
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
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- ☒ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
- d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

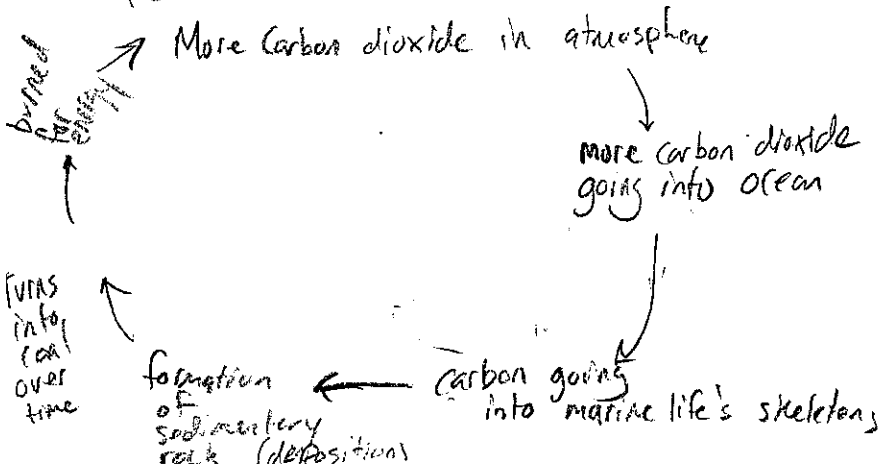
Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

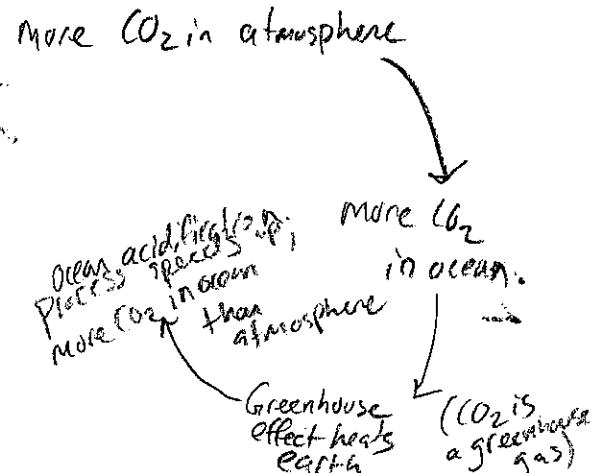


Ocean acidification is the process that lowers the pH level of the oceans by introducing carbon dioxide to the water. Carbon dioxide from the atmosphere enters the water and combines with the water molecules. From there the molecules slowly break down, releasing H^+ ions into the water. The amount of carbonic acid, or HCO_3^- , in the water determines the acidity. With more carbon dioxide in the atmosphere, the ocean (or hydrosphere) will attempt to reach equilibrium within the carbon cycle by bringing in more CO_2 from the atmosphere. The more CO_2 in the water leads to more HCO_3^- forming, so the water would become more acidic (pH ↓).

Positive Feedback



Negative Feedback



A41727610

(17)

ISP 203A: GLOBAL CHANGE

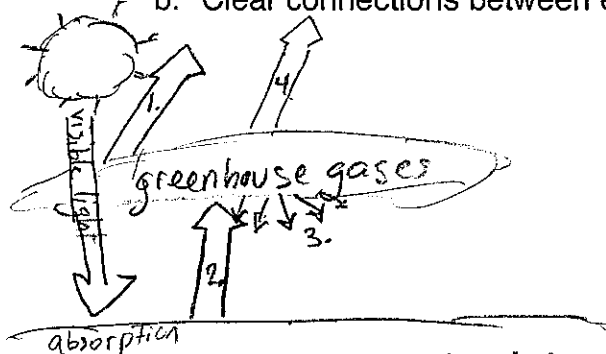
4

FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

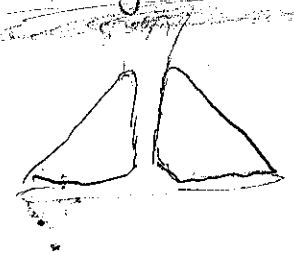
- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.



The greenhouse effect begins when the Sun radiates visible light energy on to the Earth. The Earth's surface absorbs the energy and re-emits it in the form of IR light. (2) The greenhouse gases in the atmosphere then absorb the IR light and re-radiate it back to the Earth in all directions. (3.)

1) Some visible light is reflected by the greenhouse gases initially

(4) Some light does make it to the atmosphere through the greenhouse gases.



When gases around magma enter the magma, the density of magma decreases. Because the density of magma < density of earth's crust, the magma begins to rise and flow out of the volcano. Ash is ejected from the volcano and forms a cloud in the atmosphere, blocking the Sun's light. Carbon dioxide is also emitted when the gases leave the magma and go into the atmosphere.

With the ash cloud blocking the Sun's light from reaching Earth, the temperature would go down. However, when the ash disappears, the extra greenhouse gases from the volcanism would trap the now radiating thermal energy, raising the temperature.

25

2 Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is liquid becoming a gas. Degassing is gas inside a liquid leaving and going into the atmosphere.

Earn up to 1 additional point on your course grade

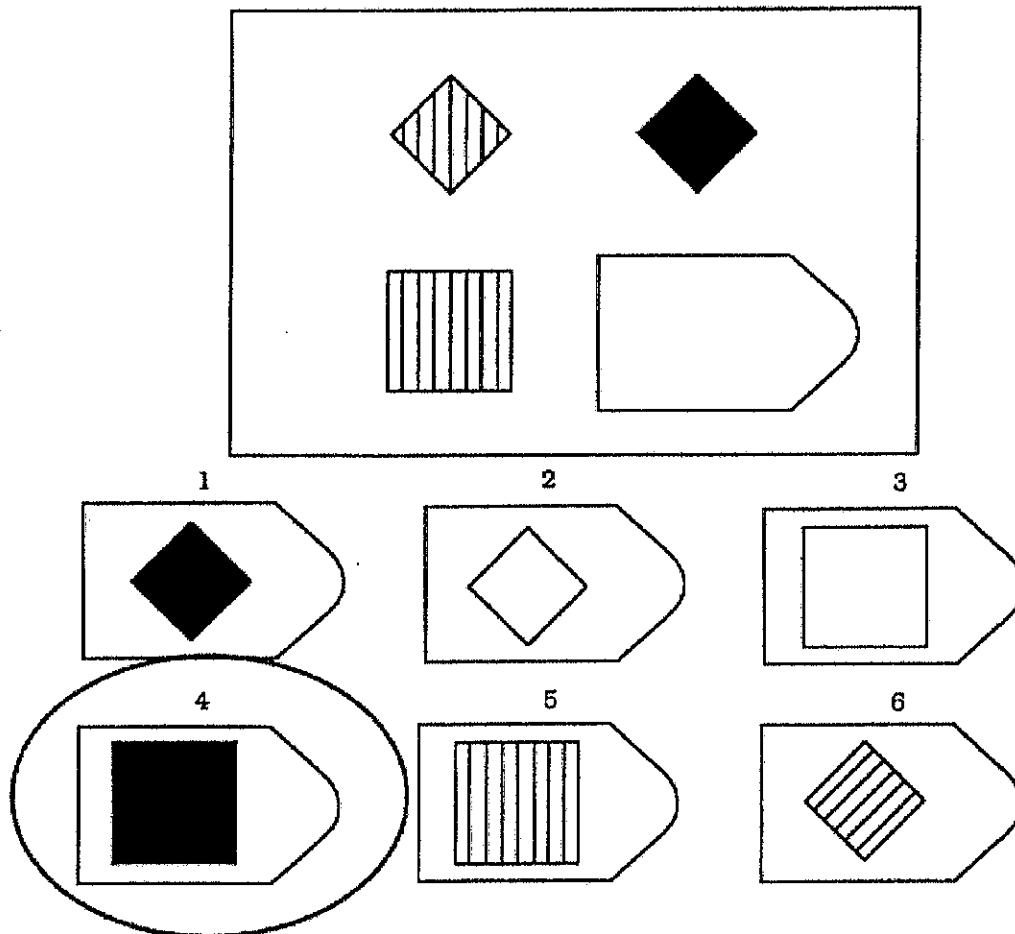
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

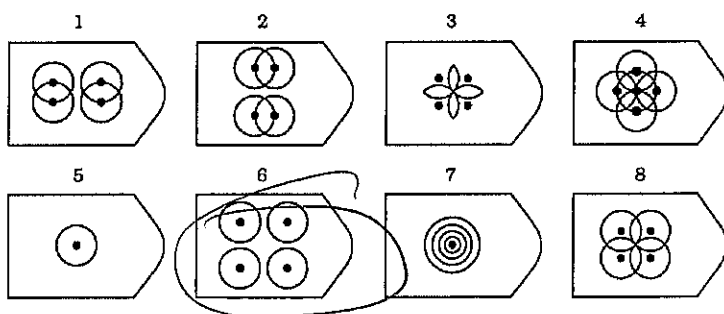
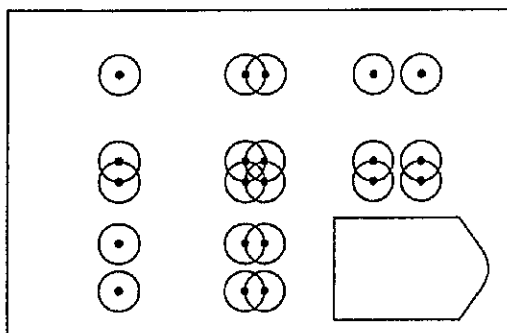


Answer: 4

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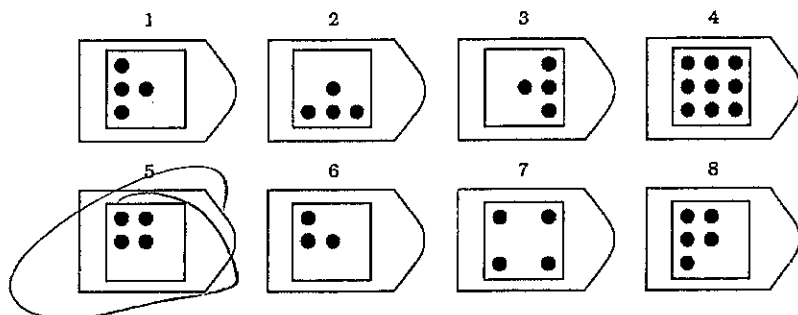
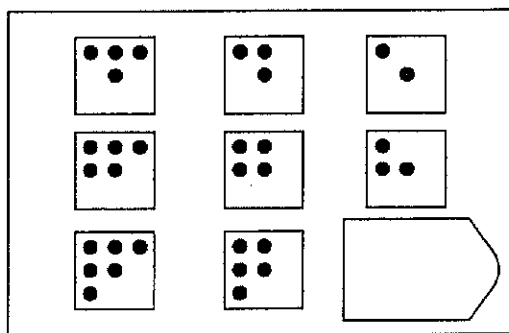
Please choose the image that best completes each of the following patterns.

PATTERN 1

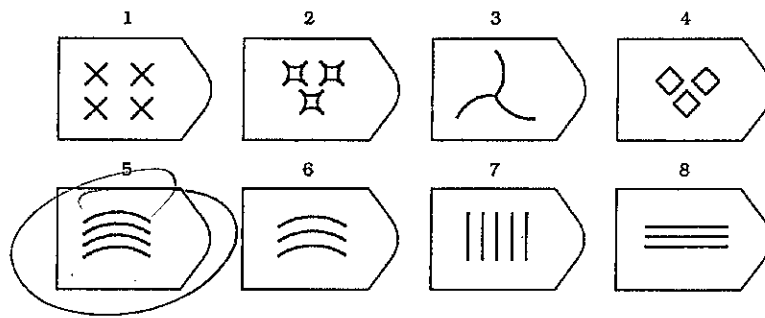
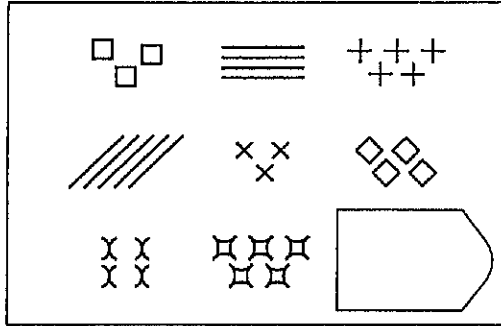


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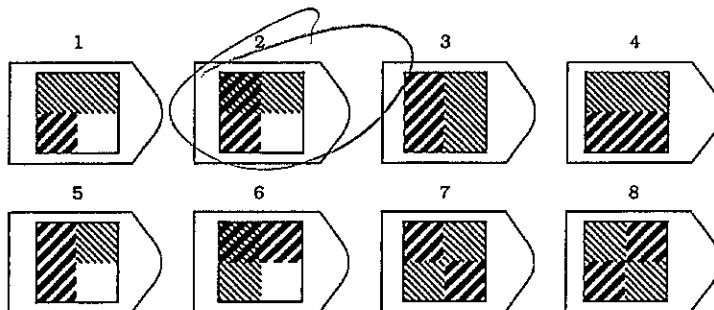
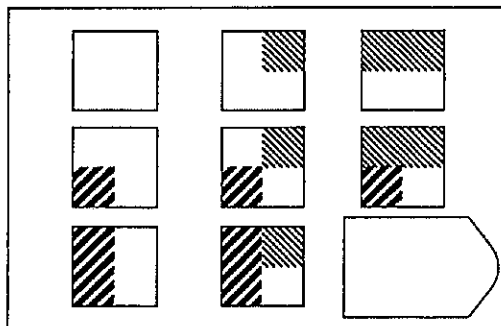
PATTERN 2



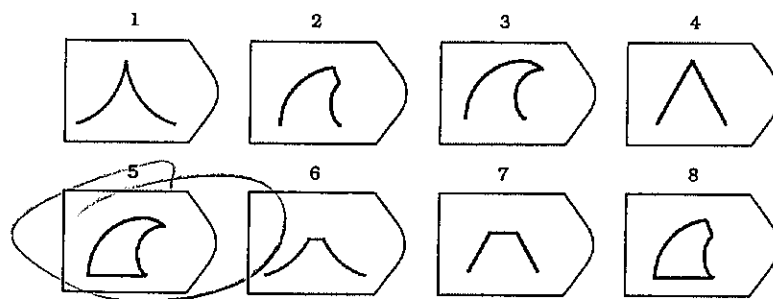
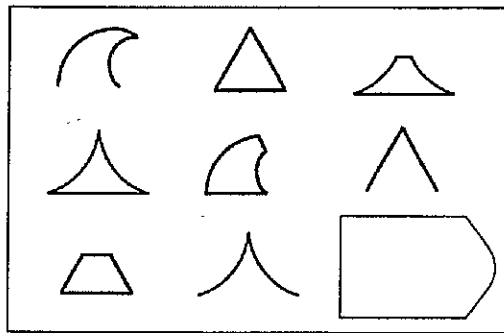
5

PATTERN 3

5

PATTERN 4

2

PATTERN 5

5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

B 1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

~~A. While debugging their broken firewall, a programmer came across top-secret CIA files.~~

☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.

~~C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.~~

~~D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.~~

A 2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

~~B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.~~

~~C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.~~

~~D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.~~

D 3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

B. Bob was able to maximize his work time by cutting back on watching TV during the day.

C. Sean has been closely monitoring his eating in an attempt to improve his diet.

☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

1 4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.

D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

A 5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.

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☒ C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.

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Please choose the response that is closest to an analogy that you might make.

A 1. Getting drunk is like...

☒ A. Getting high. They are both involve too much of a chemical influencing the body.

☐ B. Hitting your head. They both involve something that causes headaches.

☐ C. Being sleep deprived. They both involve impaired functions.

☐ D. Eating too much candy. They both involve lack of self-control.

☐ E. Sleeping late. They are both caused by lack of self-control.

C 2. Water freezing is like...

☐ A. Dew forming. They are similar because they both involve a drop in temperature.

☐ B. Blowing up a balloon. They are similar because they both involve becoming less dense.

☒ C. Clouds forming. They are similar because they both involve a phase change.

☐ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48310

What is your gender?

☒ Male

☐ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☒ Caucasian

☐ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

STUDENT NAME: A42SD3261

GROUP: C17

Version B

62
I was at the
office hours
before the exam

MULTIPLE-CHOICE. 5 points each (50 points total).

Exam 2 Grade S1 not 47

- B
1. Which of the following would be considered a negative feedback to increasing global temperature?
- Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - ☒ Melting of permafrost resulting in more methane escaping into the atmosphere
 - An increase in evaporation and cloud formation resulting in the release of latent heat
 - An increase in desert formation resulting in more dusting blowing into the atmosphere
- B
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- The magma becoming colder
 - ☒ Gas bubbles forming in the magma
 - The surrounding crust becoming hotter
 - Crystals forming in the magma
- C
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- A= erosion, B= deposition, C= uplift and erosion
 - A= erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - A= dissolution, B= deposition, C= uplift and deposition
- B
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- Human activities are the primary cause of the greenhouse effect.
 - ☒ Natural processes are the primary cause of the greenhouse effect.
 - Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - Neither human activities nor natural processes are important causes of the greenhouse effect.
 - The human and natural causes of the greenhouse effect are not understood.
- B
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- Reservoir A has a shorter residence time than Reservoir B.
 - ☒ Reservoir B has a shorter residence time than Reservoir A.
 - Reservoir A and Reservoir B have equal residence times.
 - More information about Reservoir A and Reservoir B is needed.
- C
6. Which of the following would cause the acidity of Earth's oceans to decrease?
- An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☒ A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

A425032-61

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- B
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- A
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

In general CO_2 levels are rising as time goes on.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- D
- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - ☒ d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- B
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
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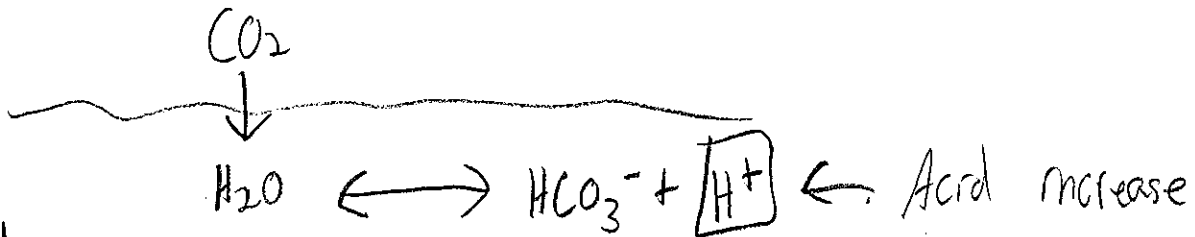
SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

a. Ocean acidification occurs when CO_2 enters the water. When the CO_2 is added to the water (H_2O), the water produces more acid (H^+). There are many different occurrences that could cause the ocean to increase its acidity. The ocean goes through the process of acidification because the atmosphere and the water must maintain a CO_2 equilibrium.



To decrease the acidity of the water the ocean must remove the CO_2 gas. The process of removing this gas is called degassing.

b. The ocean experiences a positive feedback because the CO_2 gas causes more of the acid to be produced to maintain equilibrium. The negative feedback would be that there is less CO_2 in the atmosphere so temperature would decrease?

AP2503261

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

4

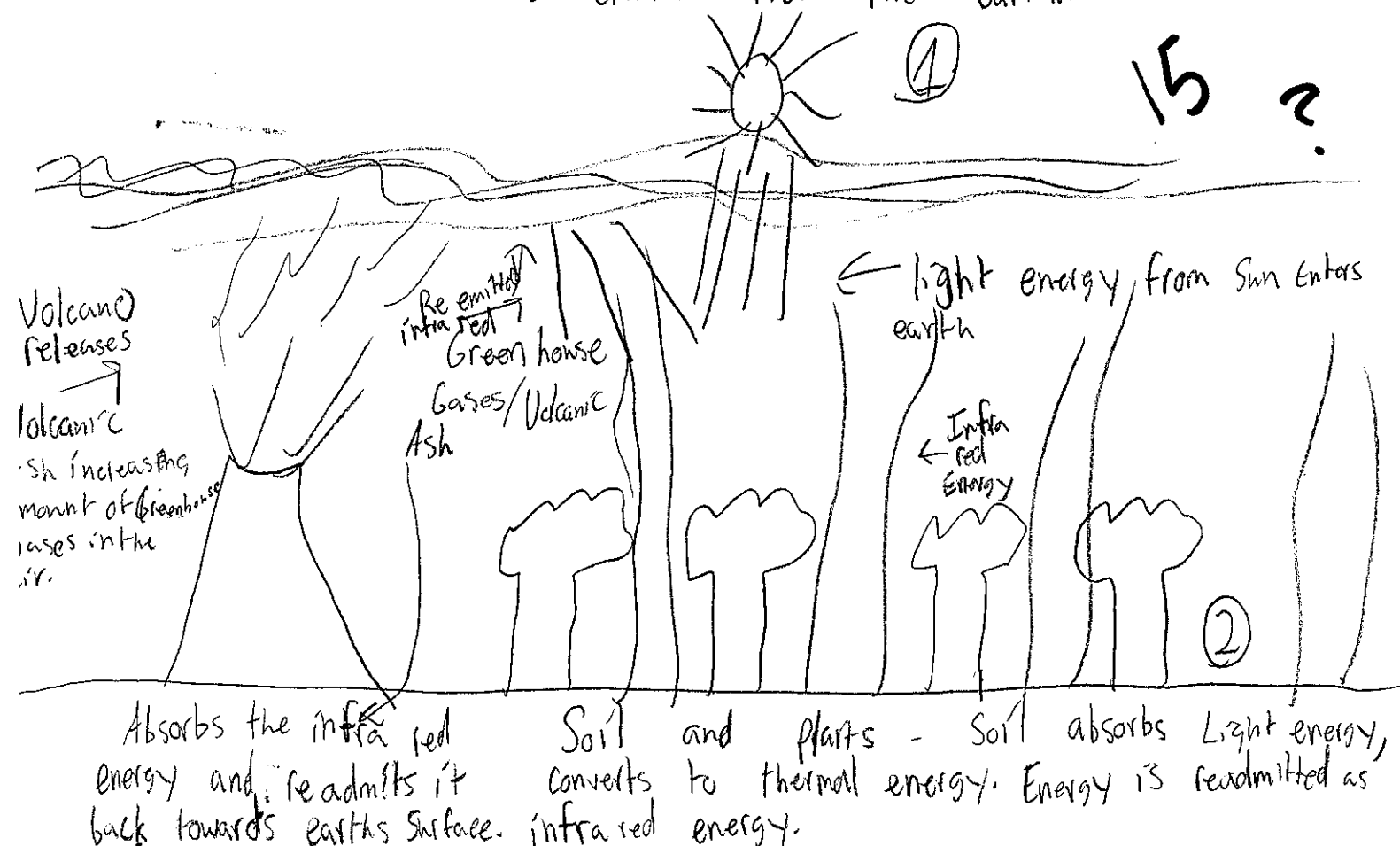
2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Continued on next page

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

a. When water pushes into a volcano this causes the magma to rise. While the magma is rising the magma is bubbling. These bubbles are produced by the magma degassing CO_2 from its composition. This CO_2 along with other gas compounds produce the ash clouds that are emitted from the earth.



Extra credit (2 points).

2 How are evaporation and degassing similar and/or different?

Evaporation is the changing of state from liquid to gas while degassing is the removal of gas from a liquid.

6. The increase in Volcanic ash would have many potential effects on earth's temperature. Potentially the ash would cause less light energy from the sun to be emitted to earth. This would cause a decrease in temperature. However an increase in CO_2 and other greenhouse gases would cause the temperature to rise because more infrared energy would be absorbed and re-emitted back to earth surface by the greenhouse gases.

Earn up to 1 additional point on your course grade

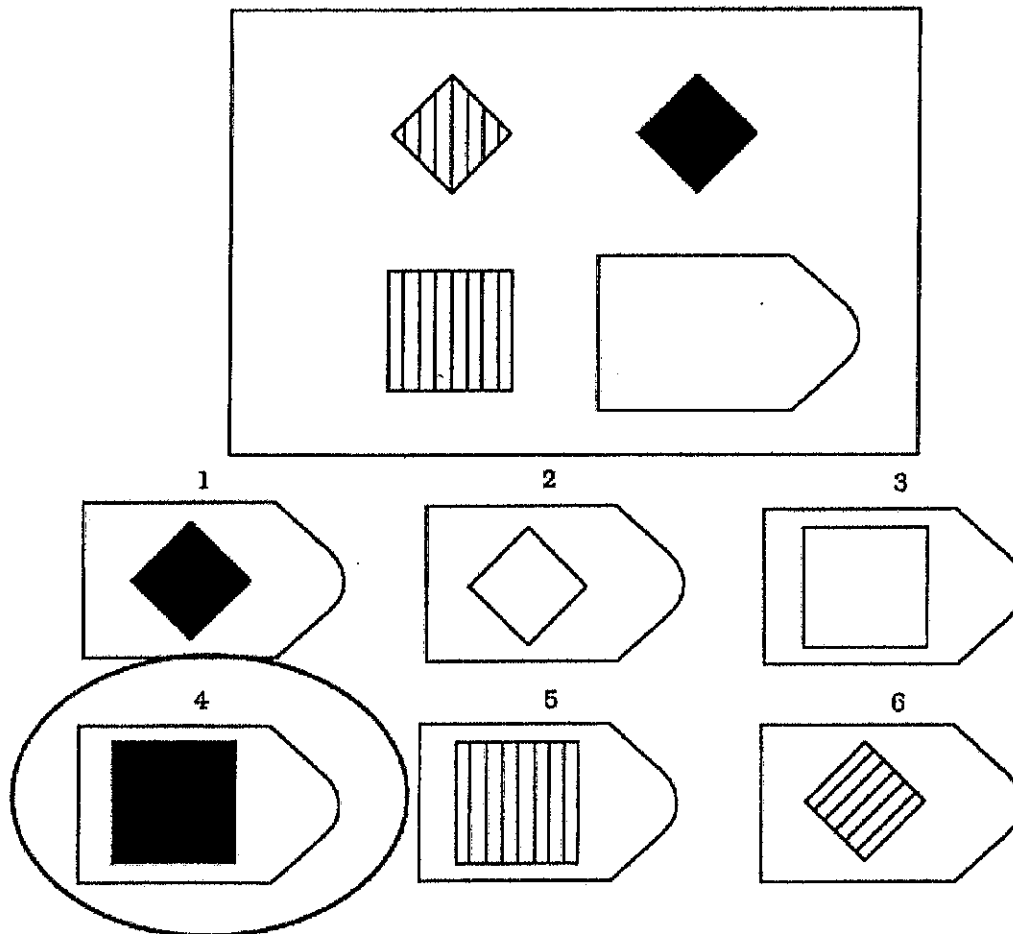
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example



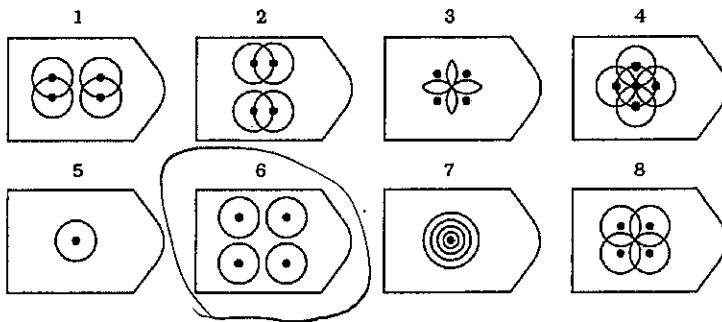
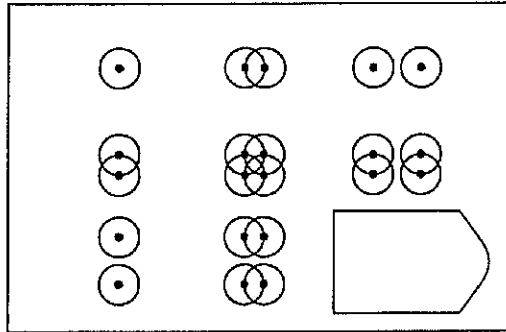
Answer: 4

PLEASE CONTINUE ON NEXT PAGE

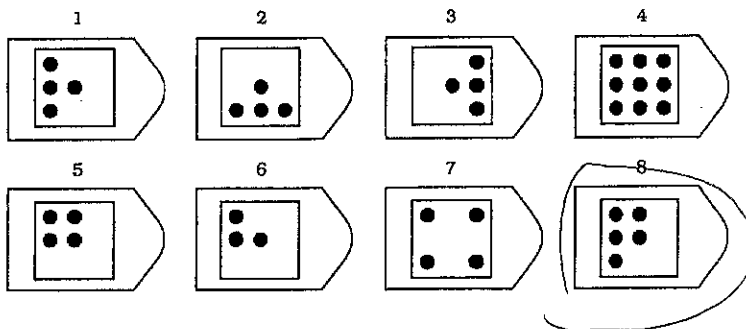
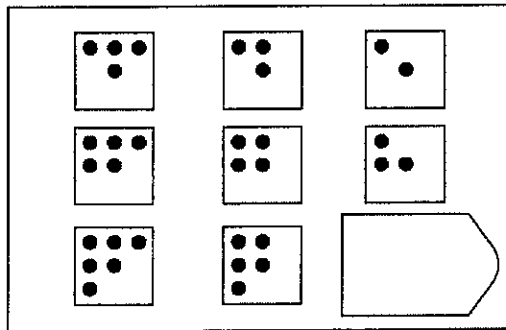
Please choose the image that best completes each of the following patterns.

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PATTERN 1

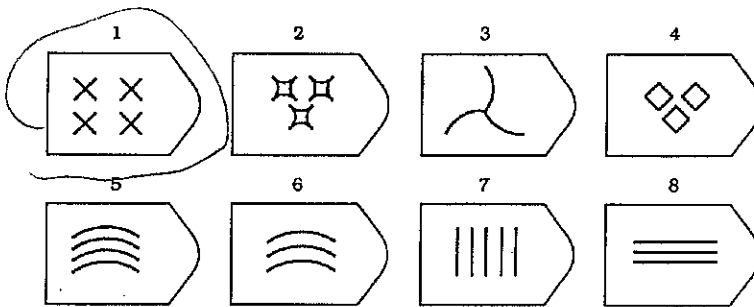
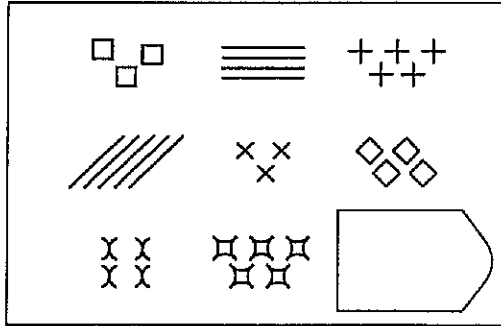


PATTERN 2

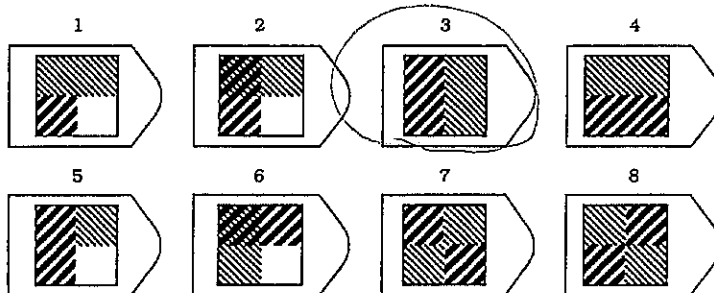
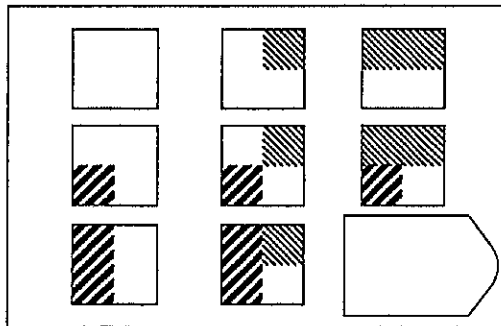


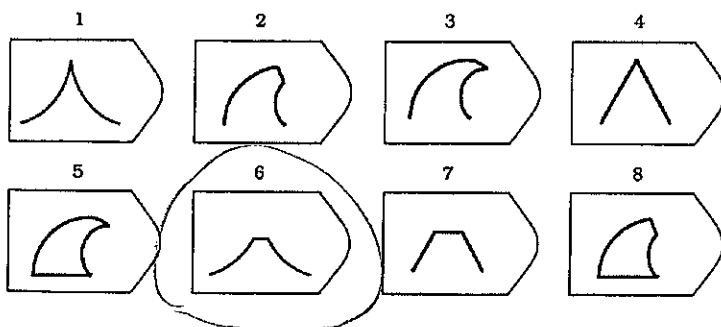
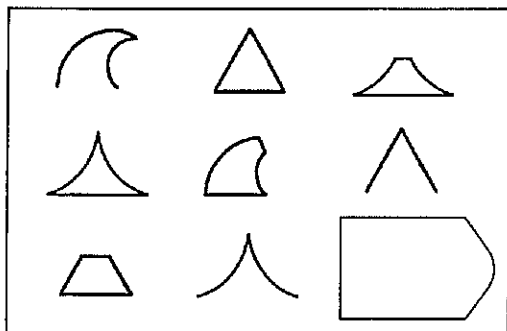
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PATTERN 3



PATTERN 4



PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- C. Sean has been closely monitoring his eating in an attempt to improve his diet.
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PLEASE CONTINUE ON NEXT PAGE

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1. Getting drunk is like...

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- C. Being sleep deprived. They both involve impaired functions.
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2. Water freezing is like...

- ☒ A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
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DEMOGRAPHICS

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What is your home zip code? 44183

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A43436466
Version A

GROUP

C18

81

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - ☒ d. Crystals forming in the magma
2. Which of the following would be considered a negative feedback to increasing global temperature?
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3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
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4. Which of the following statements about the greenhouse effect on Earth is most accurate?
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6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
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 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
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8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
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 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
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9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
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10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

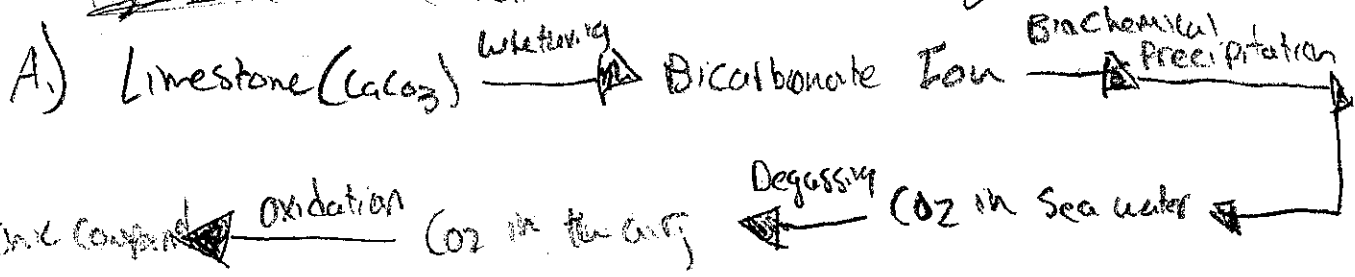
1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

See next page as well as what is on the bottom

~~First of all I would like to explain how ocean acidification works. Ocean acidification has to do with carbon dioxide combining with sea water to form a bicarbonate ion. This is a part of the carbon cycle. You can't start the carbon cycle at any point I would like to start with the air it through a process called respiration. This combines the CO_2 from the air with a water molecule in the water. This happens in the carbon cycle.~~



20

The carbon becomes part of the earth then compounded into lime stone again, where this process starts over. From here it is easy to see that there positive feed-back could happen. More carbon added to the atmosphere just causes form more carbon to go through the cycle, which would eventually be too much for plants to respire with. Since plants cannot keep up with this added amount of carbon the carbon will just continue to go through this cycle at an accelerated rate.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

A.) The greenhouse Effect is a tricky process that involves ~~the~~ amongst different parts of the Earth along with the sun. The greenhouse Effect starts by the radiation of the sun. The sun's radiation gives off visible light, light that is purely radiation. Once that radiation gets into the earth's atmosphere, it will do one of 2 things. One it will get reflected off the earth's surface back into outer space. Or 2, it will be absorbed by the earth and re-admitted into the atmosphere as heat or infrared light. Once re-admitted the ~~a portion of the~~ infrared light will be trapped in the earth's atmosphere by greenhouse gases (CO_2 , methane, water vapor). once the infrared is re-reflected in by these gases. It will be sent back down to the surface to either reflect or be re-absorbed and sent back into the atmosphere again. These infrared light trapped in the atmosphere by the gases is what keeps the earth warm when the sun goes away at night.

B.) What volcanism would do is it would keep out the radiation from the sun so there would not be as much radiation to be reflected or absorbed and re-admitted into the atmosphere. It is hard to say exactly ~~if the earth's~~ what the earth's atmospheric temperature would do though. It depends on the emissions and greenhouse gases. If there was a decline in greenhouse gases then the temp would drop dramatically ^{here is naming} because ~~it is naming~~ to hold in a little bit of re-admitted sun light! If greenhouse gases continued to rise then the temp on earth would probably stay the same because they would be able to retain more infrared light.

25

1 Extra credit (2 points).

How are evaporation and degassing similar and/or different? Evaporation and degassing are kind of the same and also different. Evaporation takes ~~the~~ a whole liquid molecule and turns it into a gas. while degassing separates the molecule and only extracts the gas particles out, leaving the liquid - degassed.

Negative Feedback: When it comes to ~~see~~ ocean acidification.

It seems apparent that more Carbon would obviously mean that ~~the~~ pH levels in the ocean would rise. When in fact that is not entirely true. An increase in Atmospheric Carbon dioxide would most likely lead to an increase in atmospheric temperature. Which means it would be harder for ocean acidification to occur because the water would become warmer. ~~So~~ Ocean Acidification is easier in cold water. ~~the~~ The rise in atmospheric temperature would mean a Negative Feedback in ~~the~~ the rise in carbon dioxide for ocean acidification.

Earn up to 1 additional point on your course grade

[ex. a 79% becomes an 80%]

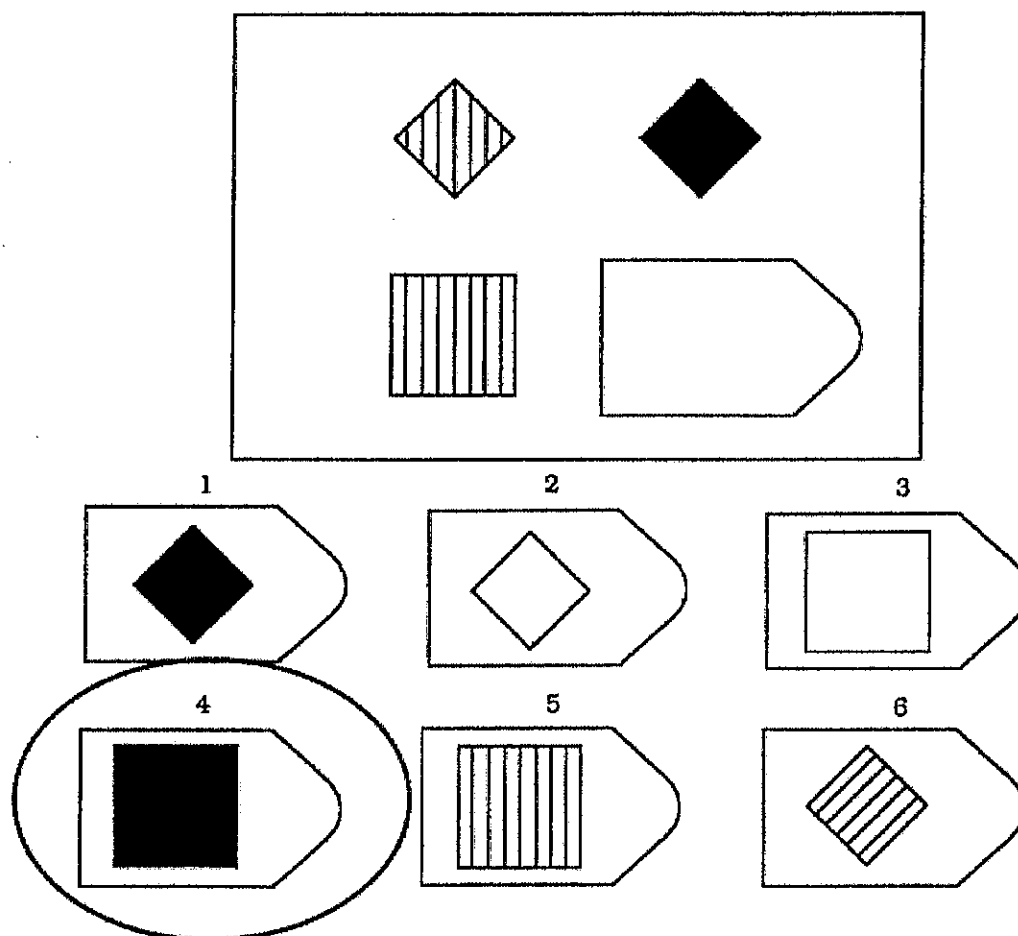
Thoughtfully complete the attached survey

1

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

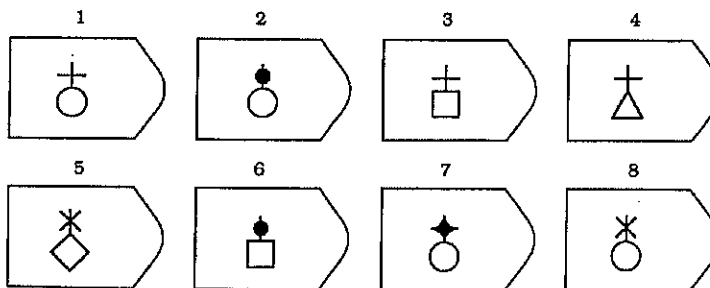
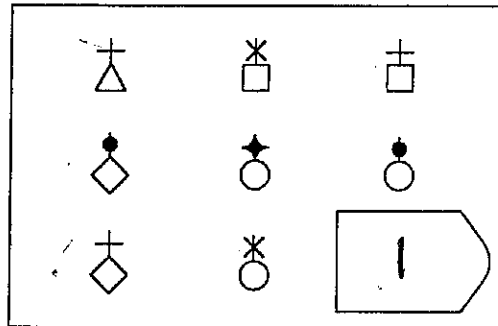


Answer: 4

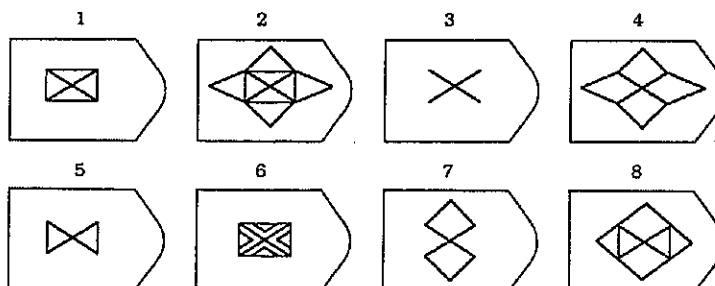
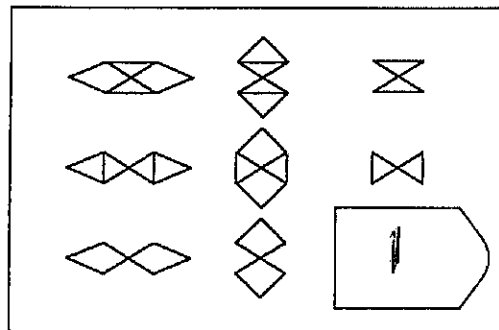
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

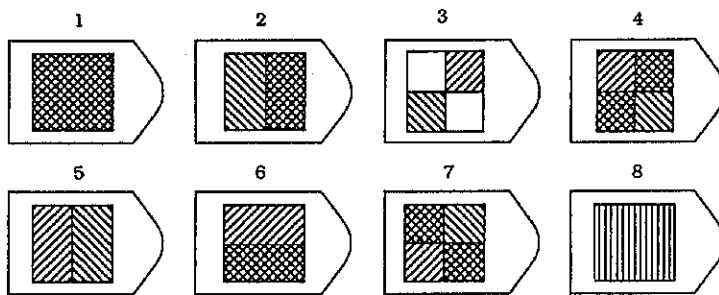
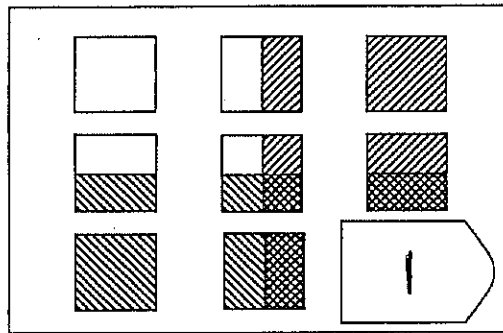
PATTERN 1



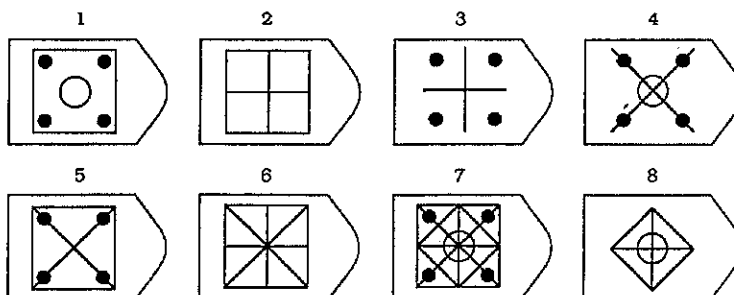
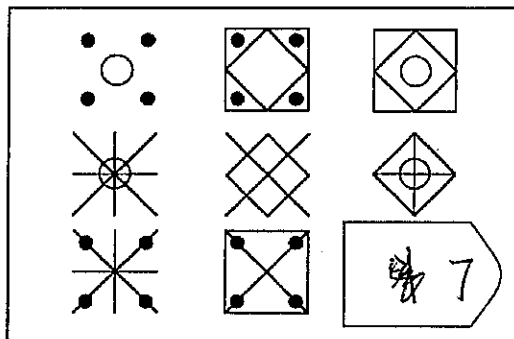
PATTERN 2



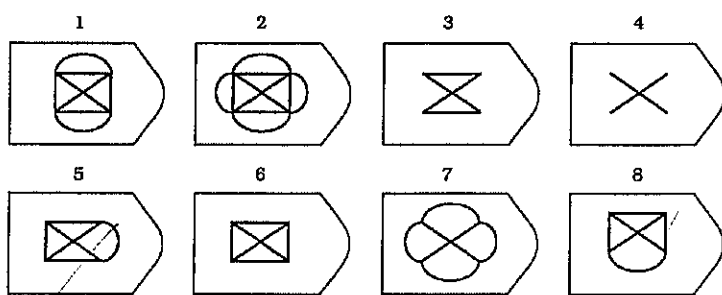
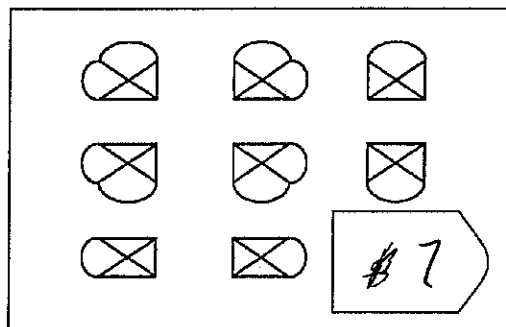
PATTERN 3



PATTERN 4



PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.
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 - ☒ C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
 - D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.
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 - C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
 - ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.
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 - B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
 - ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
 - D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

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- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

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- ☒ A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 14 years

What is your home zip code? 10533

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A41417295
Version A

GROUP: C18

87

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- The magma becoming colder
 - Gas bubbles forming in the magma
 - The surrounding crust becoming hotter
 - ☒ Crystals forming in the magma
2. Which of the following would be considered a negative feedback to increasing global temperature?
- Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - Melting of permafrost resulting in more methane escaping into the atmosphere
 - An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☒ An increase in desert formation resulting in more dusting blowing into the atmosphere
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- A= erosion, B= deposition, C= uplift and erosion
 - A = erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - A = dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- ☒ Human activities are the primary cause of the greenhouse effect.
 - Natural processes are the primary cause of the greenhouse effect.
 - Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - Neither human activities nor natural processes are important causes of the greenhouse effect.
 - The human and natural causes of the greenhouse effect are not understood.
5. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☒ An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- Reservoir A has a shorter residence time than Reservoir B.
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ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
- ☒ 10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

A) Ocean Acidification is caused by the interactions between H_2O + CO_2 . This causes hydrogen ions to be released which increase the acidity of the oceans. CO_2 in the atmosphere + CO_2 levels in the oceans are related reservoirs, + increasing the CO_2 levels of the atm would cause more CO_2 to enter the ocean, then interact w/ H_2O + form HCO_3^- + hydrogen ions, making the ocean more acidic.

B) It is difficult to say if this would cause a negative feedback or positive feedback loop on ocean acidification because of the relationship between temperature, + the oceans ability to absorb CO_2 . Colder water can hold more than warm water. Because CO_2 is a greenhouse gas, increased levels in the atmosphere would cause a temp rise, + make the oceans warmer (this is a negative feedback loop) decreasing their ability to hold ions. Overall the levels of CO_2 entering the oceans even at higher temp would make the oceans more acidic, overall.

CONTINUED ON 5 →

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

25 Greenhouse effect: Earth's Atmosphere is heated by the Energy from the SUN (Visible, IR, & UV Light). When this light enters our atm, greenhouse gases, like CO_2 , allow the visible light to pass through to the Earth's surface where it is absorbed. Some of that ^{visible} light will bounce off the surface, clouds, or ice back through the g.g.'s & into space. The light that is absorbed by the surface is re-emitted as IR light, or heat energy. Greenhouse gases absorb IR light unlike visible light, then they get excited, & re-emit the IR in all directions. Losing some to space, but some goes back to Earth & repeats the process again.

Volcanos: The effect volcanos have on the atmospheric temp is through emission of greenhouse gases, & ash that blocks light from getting to the Earth surface.

If a volcano erupted a large ash cloud that would block a lot of light from reaching the surface & being absorbed & re-emitted as IR & heat energy, significantly slowing warming & the greenhouse effect. However, the ash would eventually

2 Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is water changing through thermal & chemical energy to gas, degassing is the removal of gas that was dissolved within

CONTINUED →

Short Answer 1) This would cause the clouds to become saturated, & not allow more CO_2 from the atm to enter, causing positive feed back for the CO_2 in the atm & global temp.

Earn up to 1 additional point on your course grade

[ex. a 79% becomes an 80%]

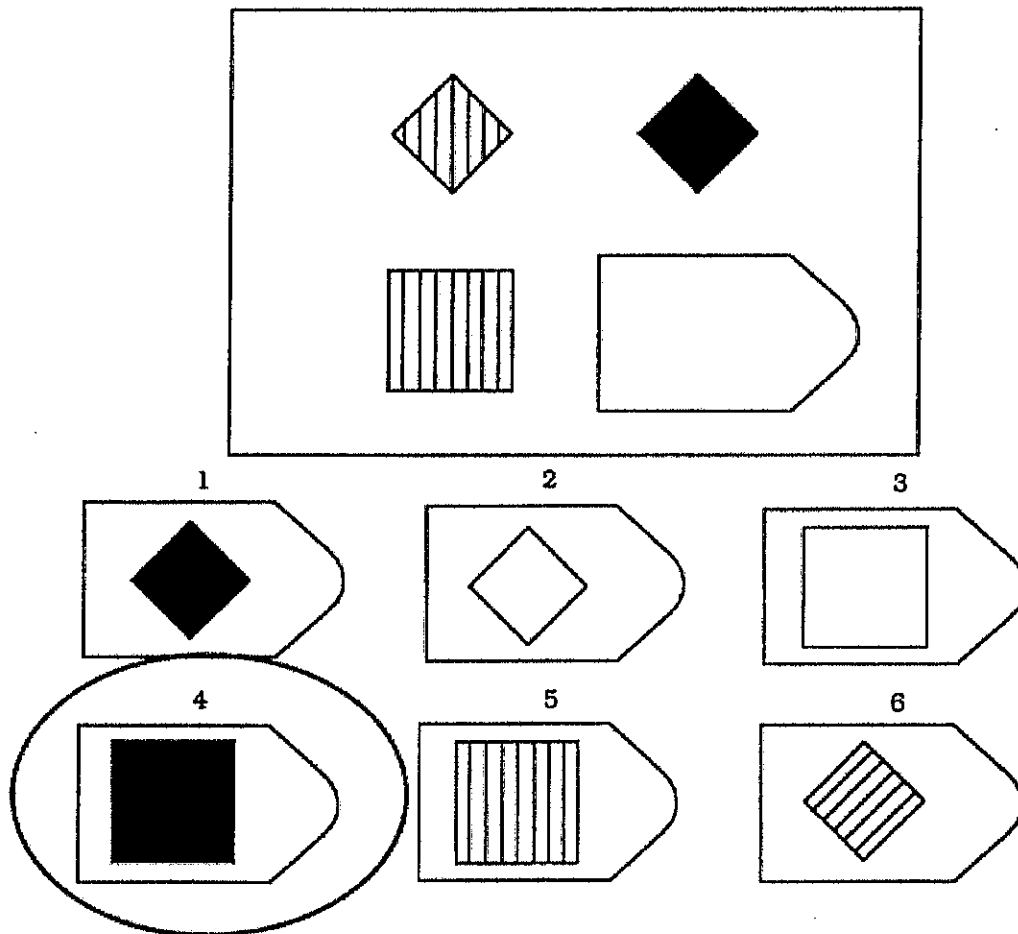
Thoughtfully complete the attached survey

Short Answer 2) This & settle, again allowing light to get to the surface of the earth. Now the gases that the eruptions emitted come into play trapping more IR light, contributing to the green house effect, & warming the planet more.

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

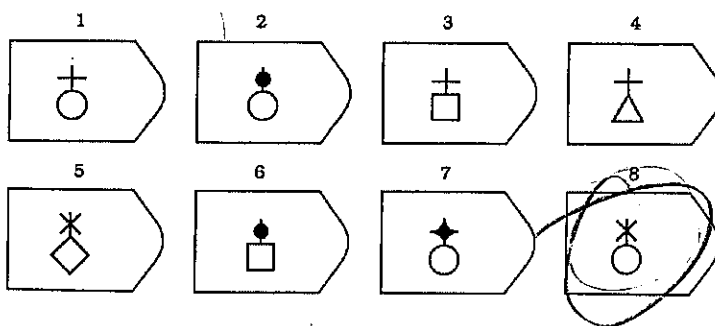
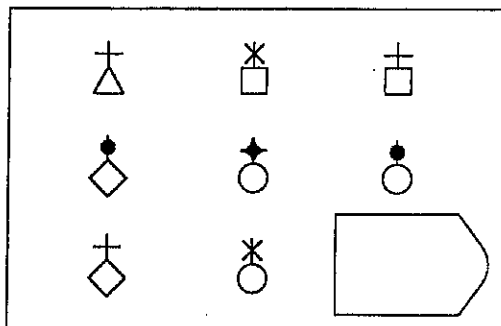


Answer: 4

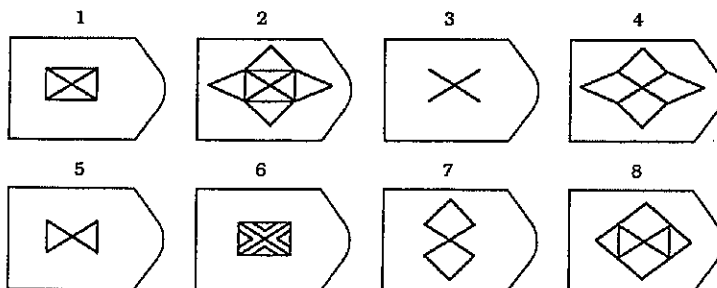
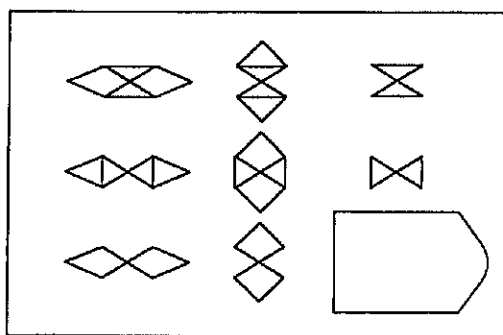
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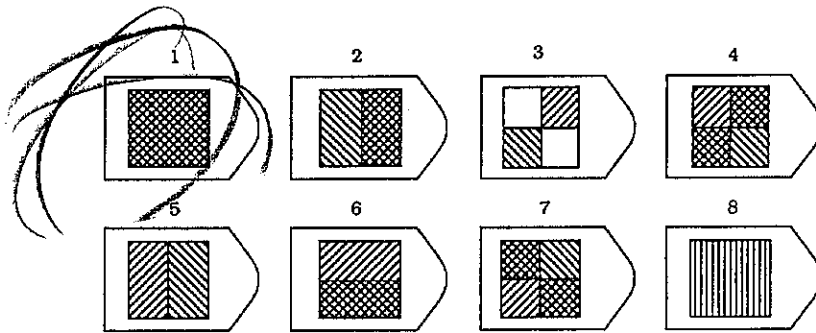
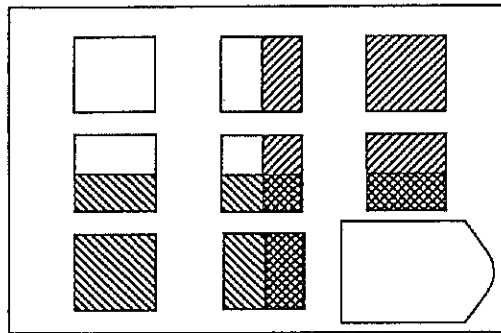
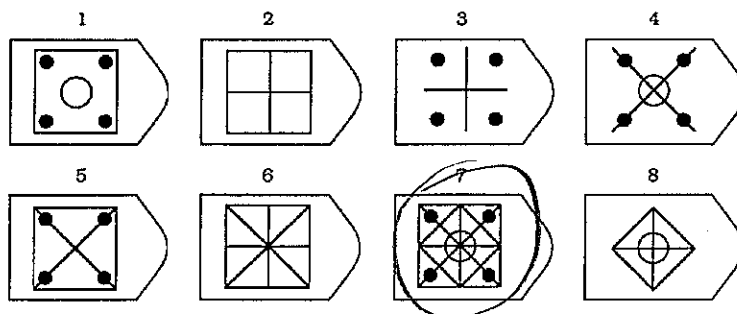
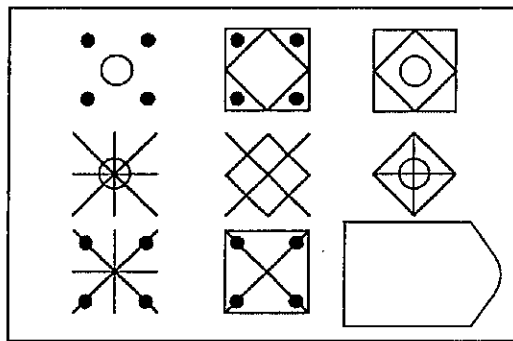
Please choose the image that best completes each of the following patterns.

PATTERN 1

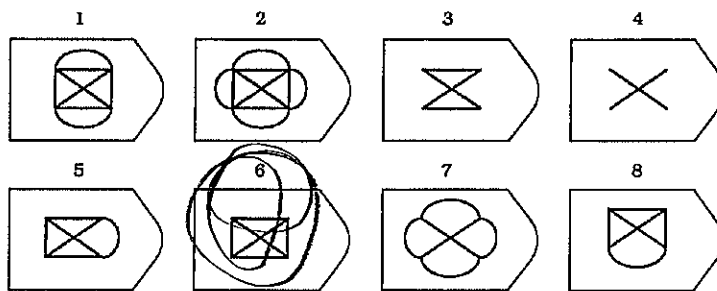
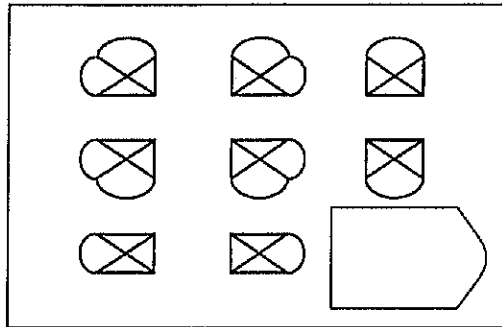


PATTERN 2



PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

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Please choose the response that is closest to an analogy that you might make.

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- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 25 years

What is your home zip code? 48103

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A41860512
Version B

GROUP: C19

90

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
 - a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
→ presumably reflecting more visible light, cooling Earth, lowering desertification
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
 - a. The magma becoming colder
 - ☒ b. Gas bubbles forming in the magma - *degassing → less dense*
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
 - a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
 - a. Human activities are the primary cause of the greenhouse effect.
 - ☒ b. Natural processes are the primary cause of the greenhouse effect. *human activities add to GH, but it's a natural process*
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
 - a. Reservoir A has a shorter residence time than Reservoir B.
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 - a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
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7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year. Which of the following statements is true?
- a. The reservoir will eventually disappear~~x~~
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller~~x~~
 - d. The reservoir's residence time is 10 years.
8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
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9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease *Albedo Effect!*
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released~~x~~ during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature. ✓
 - c. Less energy will be released~~x~~ during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative~~x~~ feedback to Earth's atmospheric temperature.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

If there were an increase in atmospheric carbon dioxide, there would be a corresponding increase in ocean acidification. When one reservoir increases in size, it exchanges more with the reservoirs, in effect increasing their size. So, if there were more CO_2 in the atmosphere, that CO_2 would also go into the ocean in order to maintain equilibrium. When CO_2 is in water, it may react with water molecules to form H_2CO_3 and a hydrogen molecule, as seen in:



H_2CO_3 is a negatively charged molecule, which is responsible for acidification. So, more CO_2 in the atmosphere would lead to more CO_2 in the ocean, more production of H_2CO_3 , and higher levels of ocean acidity.

With higher levels of H_2CO_3 , it is possible that there could be more CaCO_3 formed by marine animals in shells, which would change the balance and cause more CO_2 to enter the ocean and ultimately form H_2CO_3 and then CaCO_3 . However, if there is too much H_2CO_3 in the ocean, it will damage those marine creatures and not be used, filling the ocean with H_2CO_3 and CO_2 , increasing the ocean's reservoir and forcing exchange of CO_2 to the atmosphere to rectify the imbalance.

23

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

With an increase in volcanism, large amounts of ash (CO_2) would be spewed into the atmosphere. It would likely take a long time for the ash to settle out.

The ash would do a couple of things. Firstly, it would cloud out much of the sun's rays, reflecting high amounts of visible light before they got to the surface. In doing this, the sun's rays would not get to the Earth and could not be re-radiated as heat, thus cooling the Earth significantly. At the same time, it is quite likely that the ash would work like a greenhouse gas, absorbing heat re-radiated from the Earth and radiating it back into the atmosphere, heating the Earth a little. It is most likely that more solar rays would be reflected than re-radiated heat would be absorbed, but the cooling caused might not be quite as bad as it would otherwise be to that.

25

2 Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation and degassing are similar in that they both involve matter moving from the hydrosphere to the atmosphere. However, they are different because evaporation, water, turns from liquid to gas, while in degassing CO_2 goes from liquid to gas.

Earn up to 1 additional point on your course grade

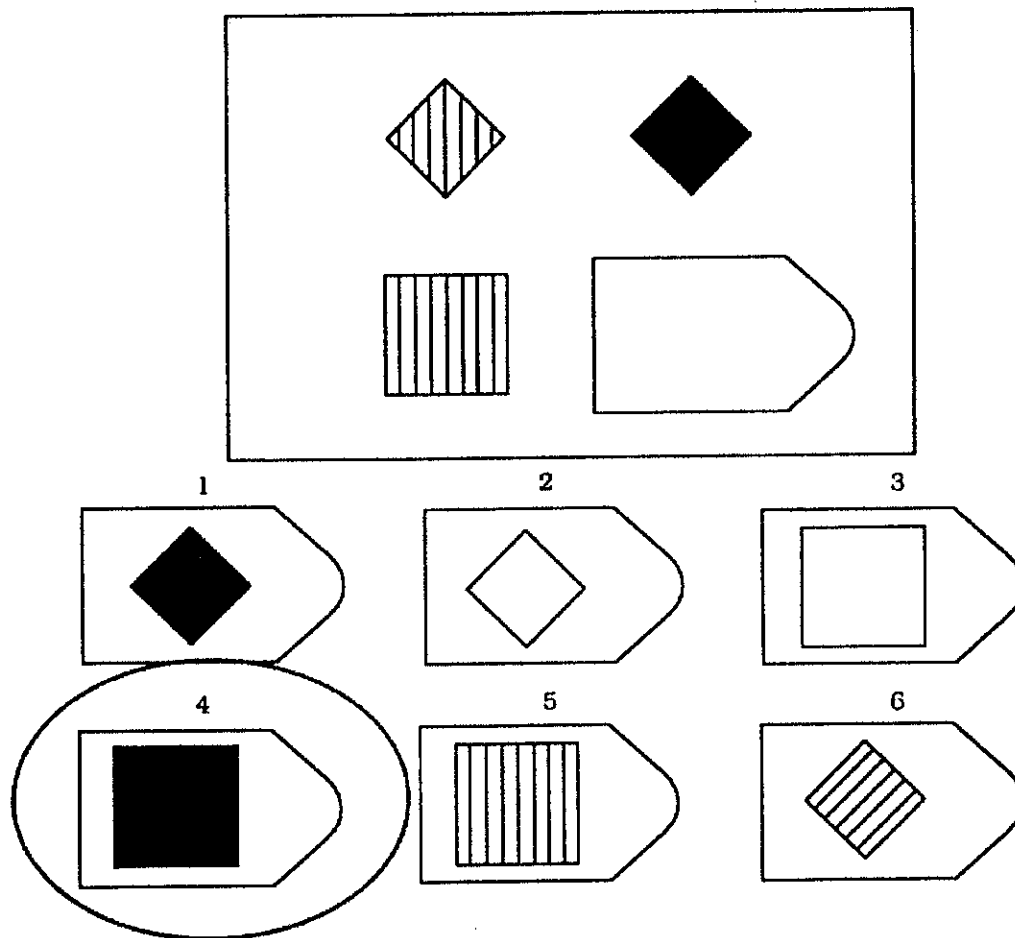
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

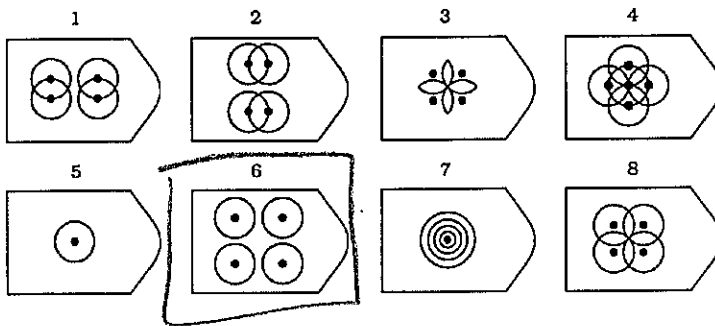
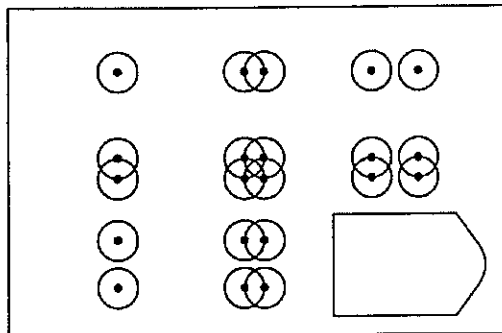


Answer: 4

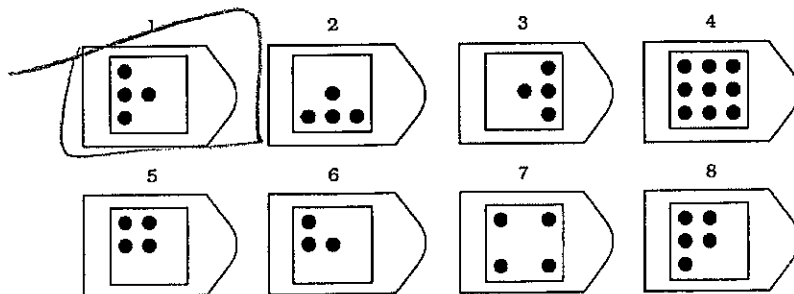
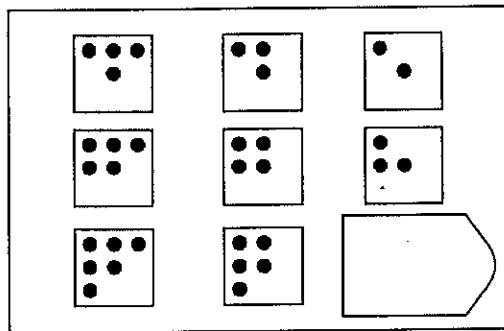
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

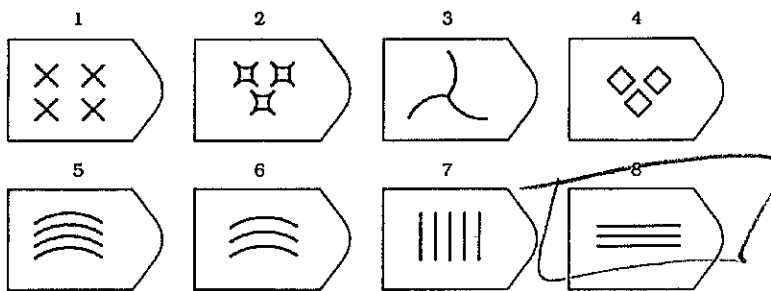
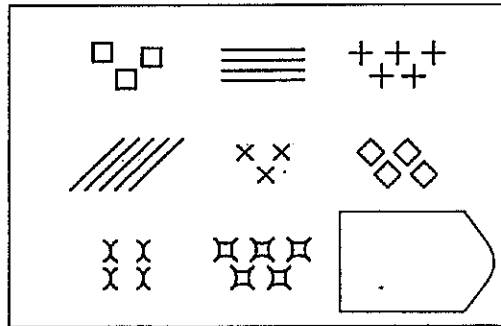
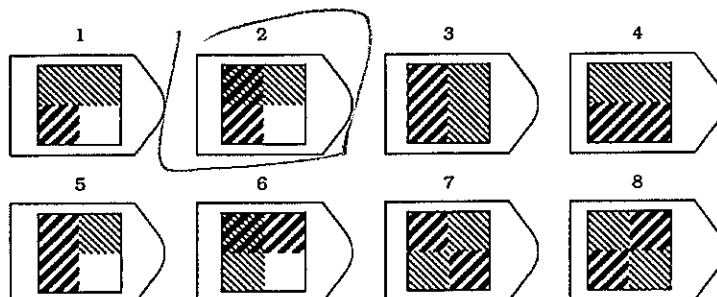
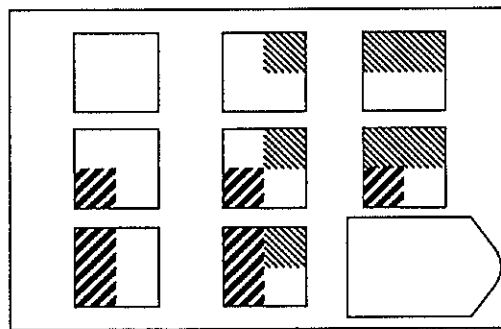
PATTERN 1

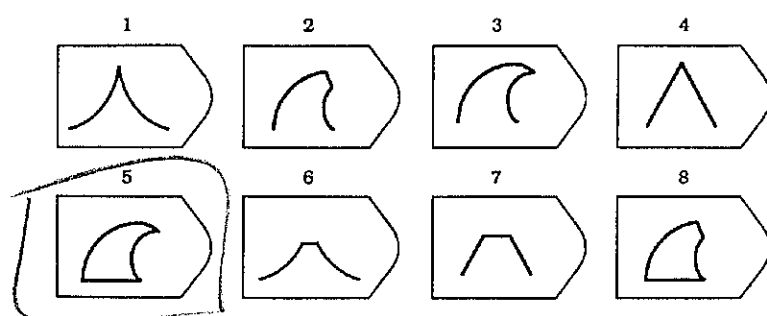
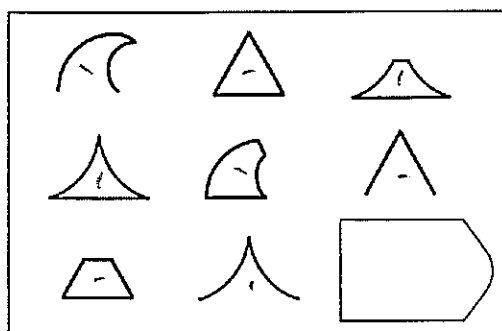


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

A. While debugging their broken firewall, a programmer came across top-secret CIA files.

☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.

C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.

D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.

C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.

D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

B. Bob was able to maximize his work time by cutting back on watching TV during the day.

C. Sean has been closely monitoring his eating in an attempt to improve his diet.

☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.

D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- ☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
- B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
- C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
- D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- ☒ A. Getting high. They both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

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- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- ☒ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48103

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian/White
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A42257459
Version B

GROUP: C19

34

MULTIPLE-CHOICE. 5 points each (50 points total).

- D 1. Which of the following would be considered a negative feedback to increasing global temperature?
- ☒ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - ☐ b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☐ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
- B 2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- ☐ a. The magma becoming colder
 - ☒ b. Gas bubbles forming in the magma
 - ☐ c. The surrounding crust becoming hotter
 - ☐ d. Crystals forming in the magma
- D 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- ☐ a. A= erosion, B= deposition, C= uplift and erosion
 - ☐ b. A= erosion, B= biochemical precipitation, C= uplift and deposition
 - ☐ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - ☒ d. A= dissolution, B= deposition, C= uplift and deposition
- C 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- ☐ a. Human activities are the primary cause of the greenhouse effect.
 - ☐ b. Natural processes are the primary cause of the greenhouse effect.
 - ☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - ☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - ☐ e. The human and natural causes of the greenhouse effect are not understood.
- B 5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- ☐ a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - ☐ c. Reservoir A and Reservoir B have equal residence times.
 - ☐ d. More information about Reservoir A and Reservoir B is needed.
- A 6. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - ☐ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

- B 7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- ☐ a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - ☐ c. The reservoir is growing smaller.
 - ☐ d. The reservoir's residence time is 10 years.
- A 8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - ☐ b. The Earth's atmosphere would become warmer than it is today.
 - ☐ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - ☐ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
- A 9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ☐ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - ☐ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - ☐ d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- C 10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ☐ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☐ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - ☐ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

AN INCREASE IN ATMOSPHERIC CARBON DIOXIDE WOULD AFFECT OCEAN ACIDIFICATION BY FIRST DECREASING OCEAN ACIDIFICATION. THE RISE IN ATMOSPHERIC CARBON DIOXIDE WOULD RESULT IN THE POSITIVE FEEDBACK OF INCREASED ATMOSPHERIC TEMPERATURE. AS A RESULT OF THIS INCREASED ATMOSPHERIC TEMPERATURE, ANOTHER POSITIVE FEEDBACK WOULD OCCUR IN WHICH THE RATE OF OCEAN EVAPORATION WOULD ALSO INCREASE. AS A RESULT OF THIS INCREASED OCEANIC EVAPORATION, MORE CLOUDS WOULD FORM → ANOTHER POSITIVE FEEDBACK. AS A RESULT, MORE OF THE SUN'S SOLAR RADIATION WOULD BE REFLECTED BACK INTO SPACE, WHICH WOULD CAUSE A DECREASE IN THE AMOUNT OF SOLAR RADIATION BEING ABSORBED BY THE PLANET → A NEGATIVE FEEDBACK. THIS WOULD ALSO CAUSE THE OCEANS TO BECOME COOLER, & THUS, ABLE TO ABSORB MORE CARBON DIOXIDE FROM THE ATMOSPHERE, WHICH WOULD BRING THE SYSTEM BACK INTO EQUILIBRIUM.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

If volcanism on Earth were to suddenly increase drastically, the spewing of large ash clouds were to also increase in relation, Earth's temperature would ^{initially} decrease. The sulfur from the volcanic eruption would create more clouds in the atmosphere, resulting in more reflection of the sun's solar energy back into the atmosphere. However, the solar energy that remains would also be "trapped" within the atmosphere with the increase in volcanic clouds, & would be reflected & trapped within Earth's atmosphere. ^{increasing temp.} So both a positive & a negative feedback would occur simultaneously. Over time, the clouds would dissipate, but the sulfur & carbon molecules would still remain in the atmosphere. This would result in the incoming solar energy to be trapped within Earth's atmosphere, as the increase in carbon molecules would act as a kind-of barrier or shield, trapping in more solar energy than normal, which would cause an increase in Earth's temperatures until the system would be brought back into equilibrium.

2

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is the process in which water molecules leave its ocean reservoir & degassing is when the carbon & sulfur molecules leave their reservoir. The action of their leaving is the similarity; however, evaporation deals with water &

Earn up to 1 additional point on your course grade

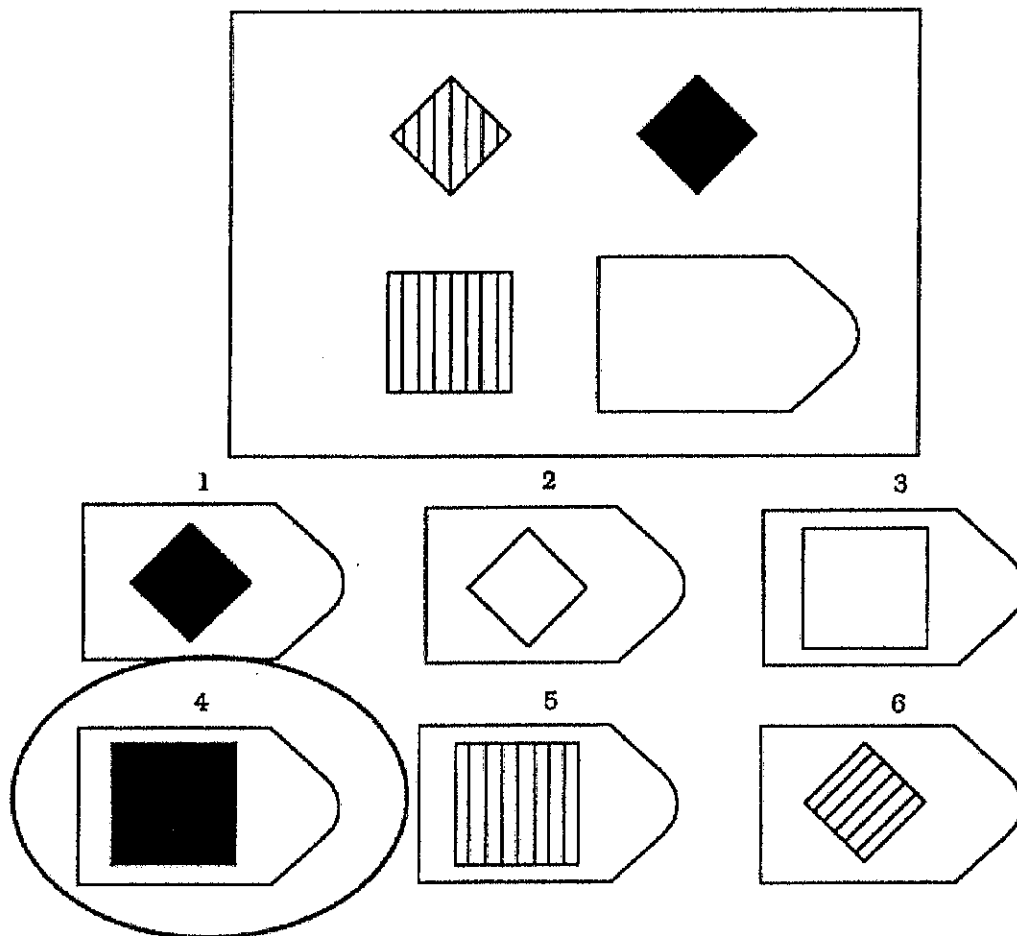
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

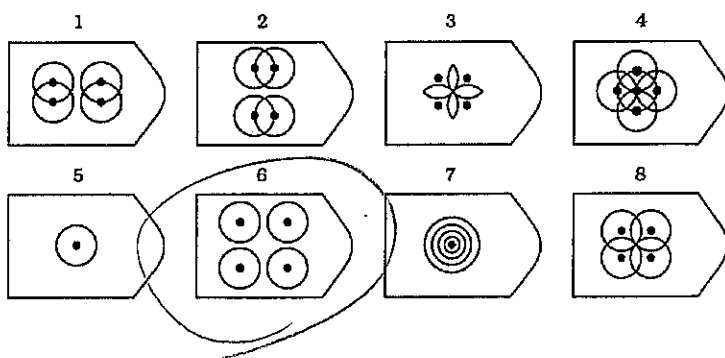
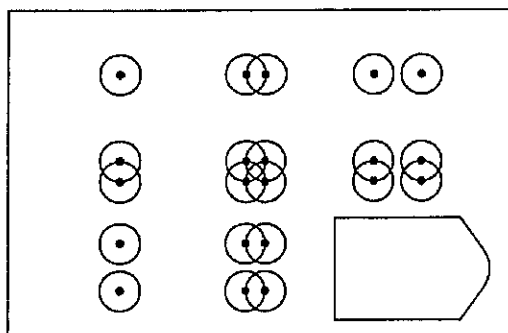


Answer: 4

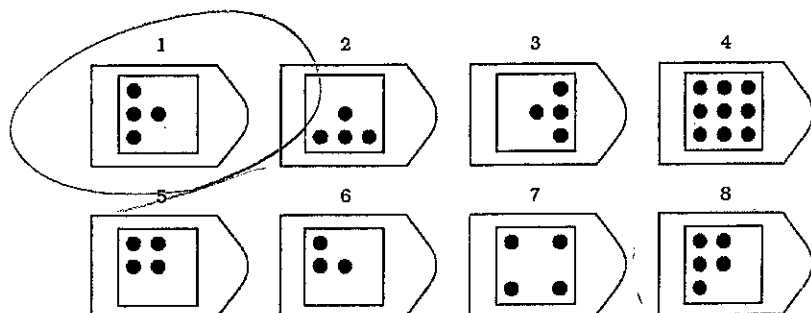
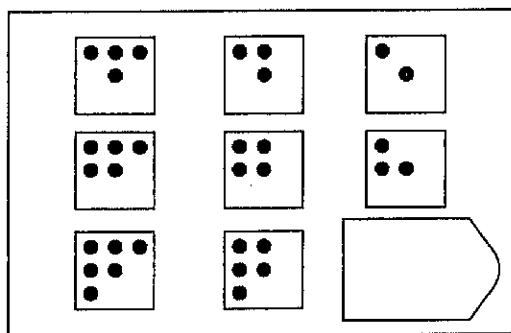
PLEASE CONTINUE ON NEXT PAGE

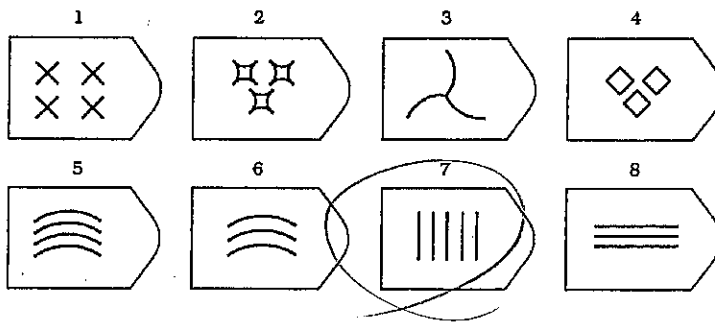
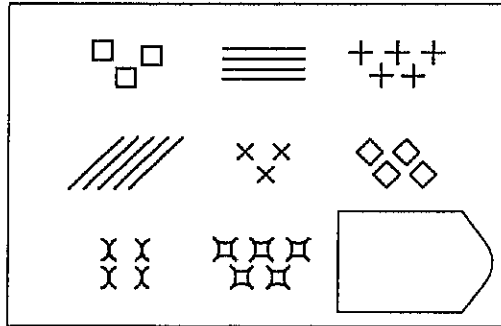
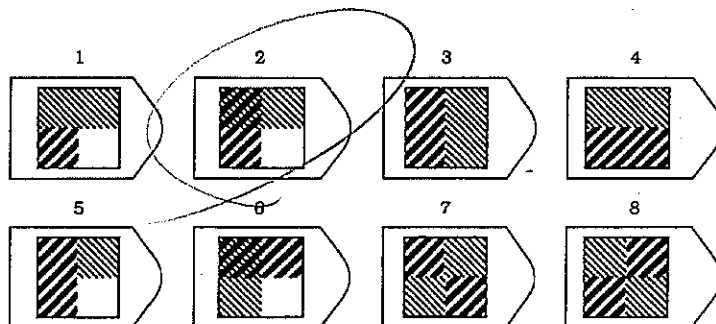
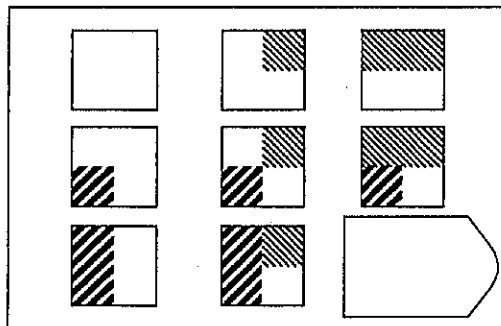
Please choose the image that best completes each of the following patterns.

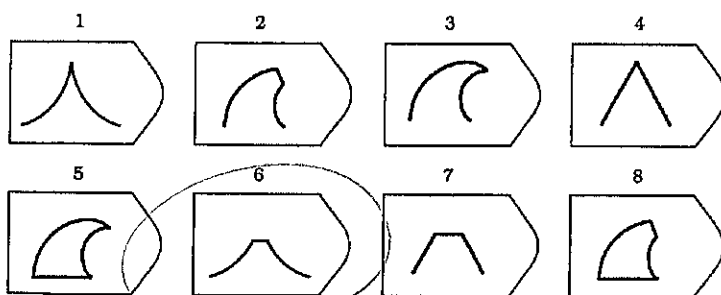
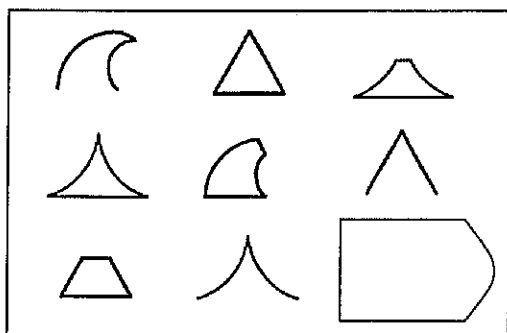
PATTERN 1



PATTERN 2



PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

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Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

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PLEASE CONTINUE ON NEXT PAGE

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2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

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- B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
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- D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

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PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

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Please choose the response that is closest to an analogy that you might make.

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- A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- ☒ C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
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2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- ☒ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 25 years

What is your home zip code? 48910

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A 4074 9278
Version B

GROUP: C19

62

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☒ C An increase in evaporation and cloud formation resulting in the release of latent heat
 - An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- The magma becoming colder
 - ☒ B Gas bubbles forming in the magma
 - The surrounding crust becoming hotter
 - Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of uplift C.
- A= erosion, B= deposition, C= uplift and erosion
 - ☒ B A= erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ C A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - A= dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- Human activities are the primary cause of the greenhouse effect.
 - Natural processes are the primary cause of the greenhouse effect.
 - ☒ C Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - Neither human activities nor natural processes are important causes of the greenhouse effect.
 - The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- Reservoir A has a shorter residence time than Reservoir B.
 - ☒ B Reservoir B has a shorter residence time than Reservoir A.
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 - More information about Reservoir A and Reservoir B is needed.
6. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☒ A An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

$$RT = \text{volume} / \text{in-out put}$$

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- b
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.

$$RT = \text{volume} / \text{in-out put}$$

$$1000 / 50 = 20$$

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- c
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - ☒ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- a
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- b
- ~~a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.~~
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
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 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide would increase the amount of ocean acidification taking place. The atmosphere & ocean are always trying to maintain similar levels of CO_2 . If one has a significantly higher amount, due to the process of de-gassing, it will release some of the CO_2 to be absorbed by the other. If there was an increase in the CO_2 in the air, over time, there would also be an increase in the CO_2 in the water because the two are trying to stay balanced.

For a positive feedback loop, there would be a steady continuous increase of CO_2 in the atmosphere & therefore the same would be true for the oceans.

For a negative feedback loop, there would no longer be an increase of CO_2 in the atmosphere, which would decrease both levels of CO_2 in the water & in the atmosphere.

20

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

7. Because of the increase in volcanoes, the overall Earth's temperature would increase. The ash would cover the floor of the Earth's surface & therefore the thermal heat created by the Sun's waves would be absorbed into the Earth's surface rather than it just bouncing off the surface & returning outside of the Earth's atmosphere. This would create a significant increase in the temperature of the Earth since the heat would be stored in the ground. With an increase in volcanic activity, there would also be more heat underground with an increase forming and releasing of magma, and once the volcano erupted, there would be an excess of thermal heat in the air. This heat would be circulated from the ground & throughout the atmosphere.

5

2 Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is a phase change (liquid to gas), while degassing is simply the transferring of gas from one substance to another.

Earn up to 1 additional point on your course grade

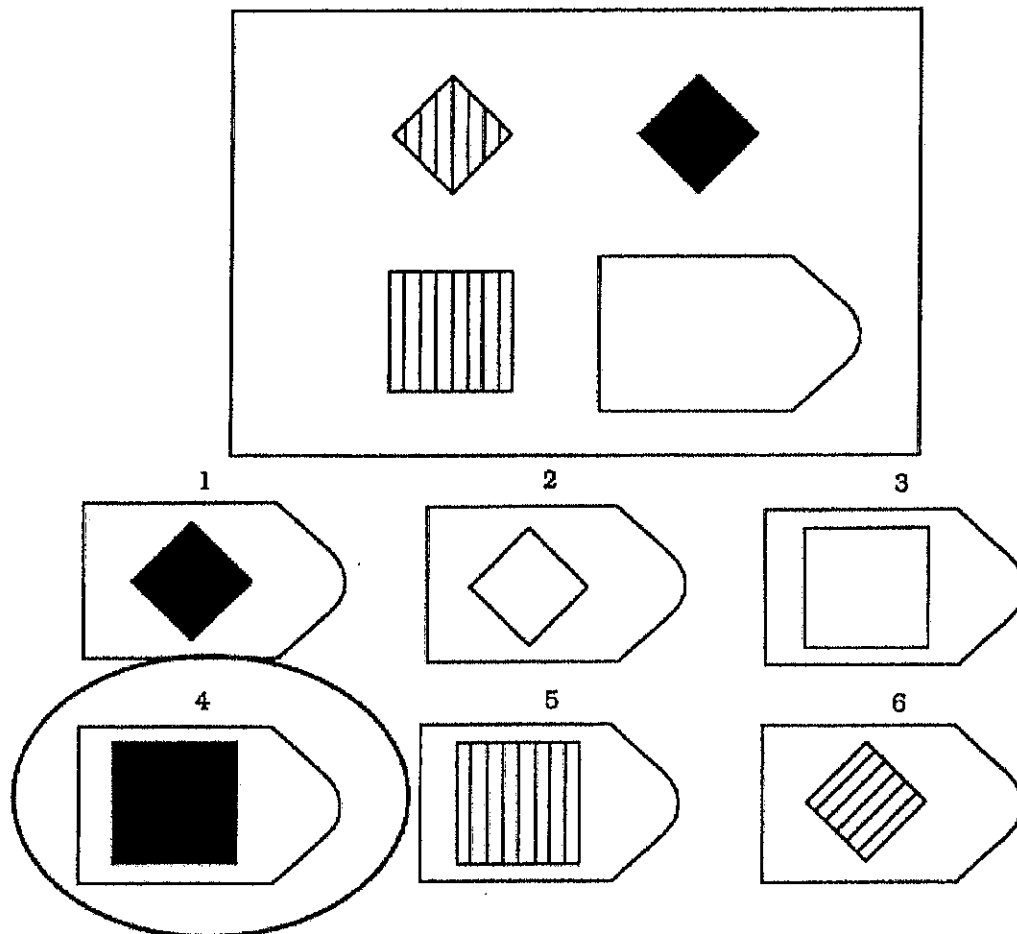
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

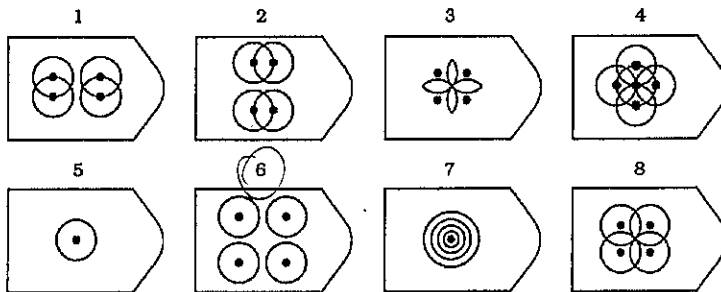
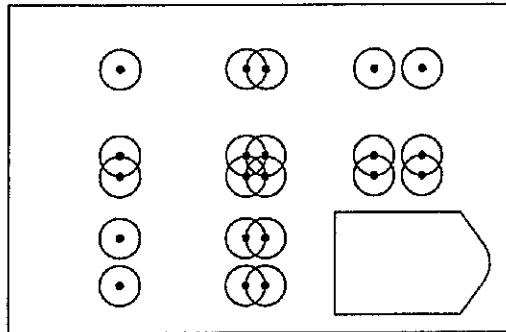


Answer: 4

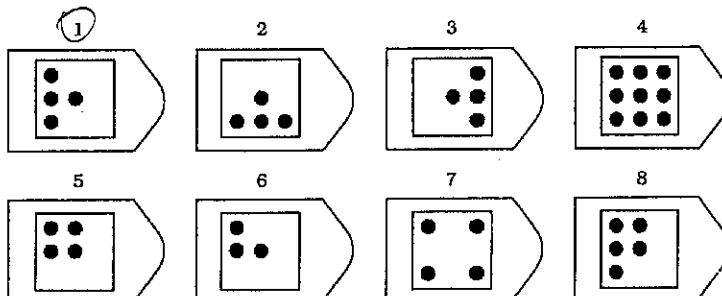
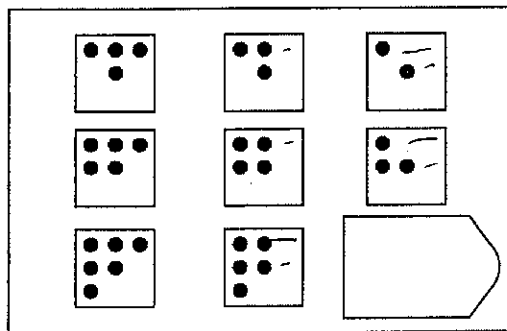
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

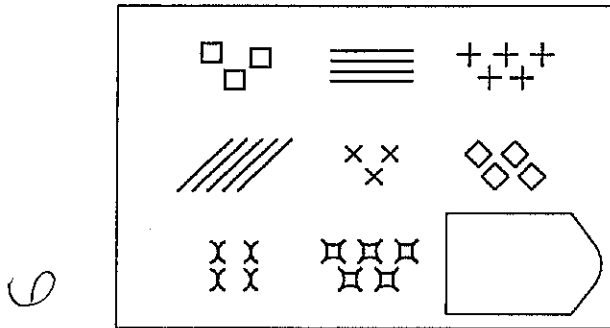
PATTERN 1



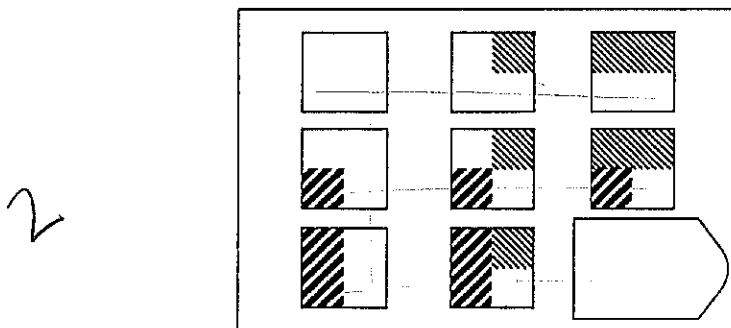
PATTERN 2

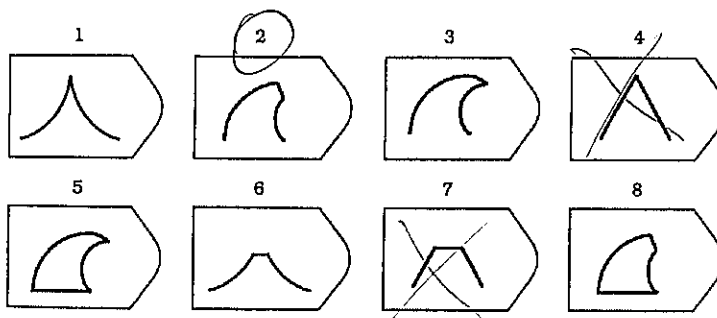
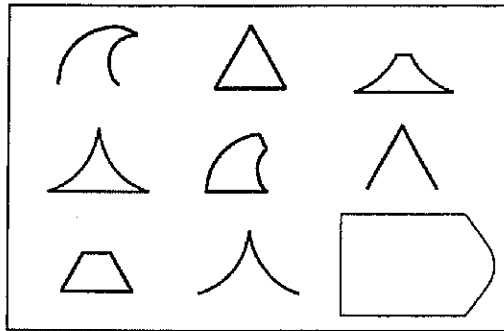


PATTERN 3



PATTERN 4



PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

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A. While debugging their broken firewall, a programmer came across top-secret CIA files.

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D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

☒ B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.

C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.

D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

B. Bob was able to maximize his work time by cutting back on watching TV during the day.

☒ C. Sean has been closely monitoring his eating in an attempt to improve his diet.

☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.

D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- ☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
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-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

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- ☒ C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☒ C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 49506

What is your gender?

☐ Male

☒ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☒ Caucasian

☐ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

STUDENT NAME: ~~A427~~ A4027800
Version B

GROUP: C19

23

MULTIPLE-CHOICE. 5 points each (50 points total).

- b. 1. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - ☒ b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
- c. 2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - ☒ c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
- c. 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition
- a. 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- ☒ a. Human activities are the primary cause of the greenhouse effect. *a*
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
- b. 5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- same inflow & outflow = equal*
- a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.
- b. 6. Which of the following would cause the acidity of Earth's oceans to decrease?
- ~~a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.~~
 - ☒ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

- b 7. A reservoir is 1000 km^3 in size, has an influx of 100 km^3/year and an outflow of 50 km^3/year . Which of the following statements is true? b
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
- a 8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates? a
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
- b 9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation? b
- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ☒ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true? d
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - ☒ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

I believe by increasing carbon dioxide ^{in the atmosphere} the ocean will become affected. ... It will be like the example in class with the Coca Cola and the diet Coca Cola. The water will become more dense because there is more carbon dioxide in the atmosphere. But eventually there will be a balance or equilibrium between the ocean and atmosphere. I believe that a positive feedback loop of an increase in atmospheric carbon dioxide affecting ocean acidification would be if human burned more fossil fuels it would add to the amount of carbon dioxide in the atmosphere. Also if there were no clouds blocking the sun from directly hitting the ocean then this radiation could cause positive feedback. But the opposite would cause negative feedback if people stopped driving their cars or if the clouds did appear it would block the sun's radiation causing negative feedback.

2

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

It would affect Earth's atmospheric temperature by decreasing the temperature. This would occur because the ash clouds would be a negative feedback to temperature increase. Ash clouds would block the sun's radiation from entering the earth's atmosphere. So first the volcanoes would increase temperature due to different greenhouse gases entering the atmosphere but due to a negative feedback which is the ash clouds the sun radiation would be blocked from entering the atmosphere which would decrease temp. The different greenhouse gases that I mentioned in the previous sentence would be methane, CO_2 and others but the increase in greenhouse gases would initially result in an increase in atmospheric temp.

5

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is when temperature or heat increase causes a liquid to become a gas. For example water in a lake goes to clouds because of temp.

Degassing is when ions or gases is in a liquid and it causes the substances to mix and erupt. For example, matter in Coca Cola if you shake can and open there will be degassing.

Earn up to 1 additional point on your course grade

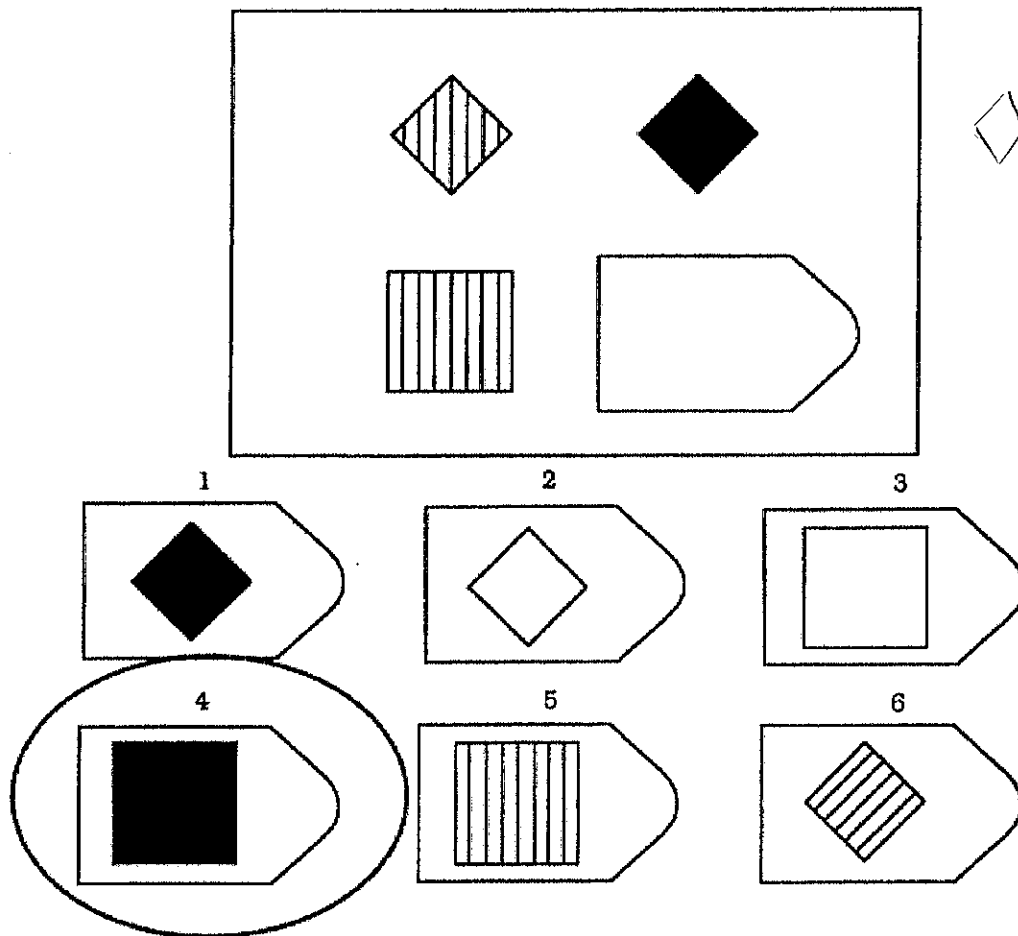
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

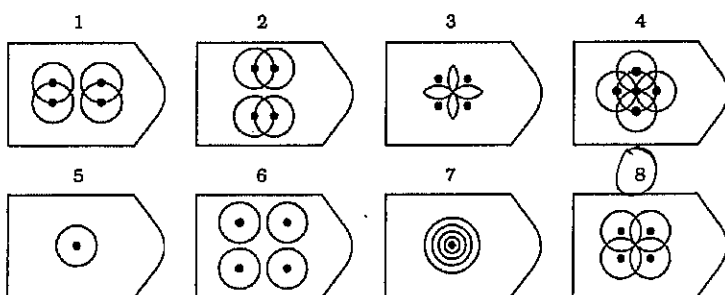
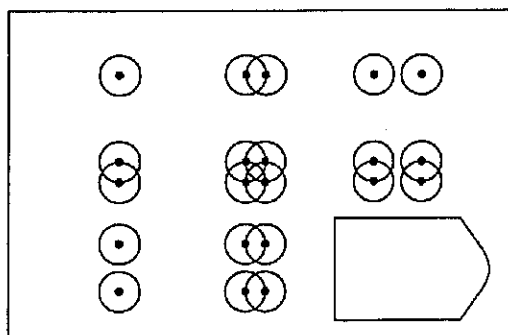


Answer: 4

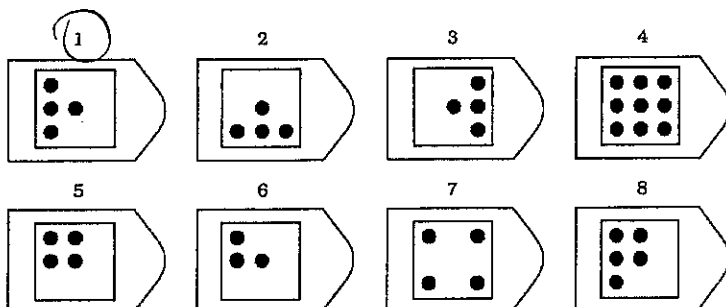
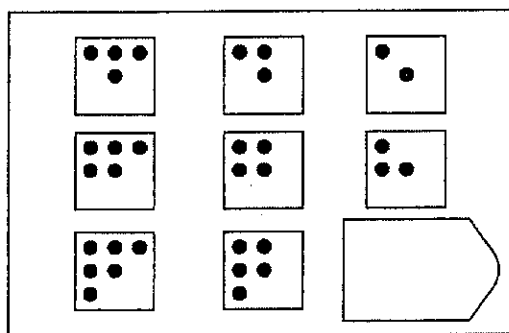
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

PATTERN 1 *8*

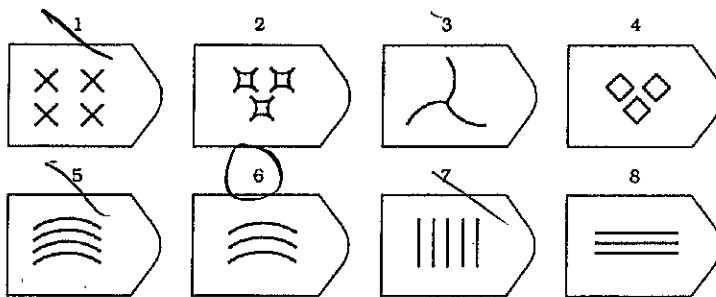
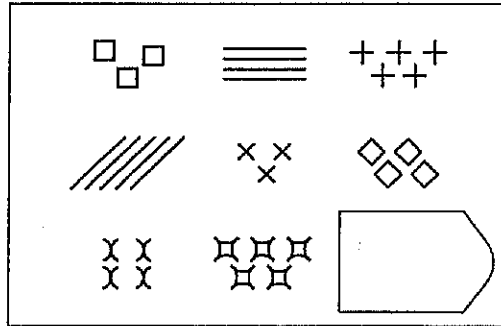


PATTERN 2 *1*



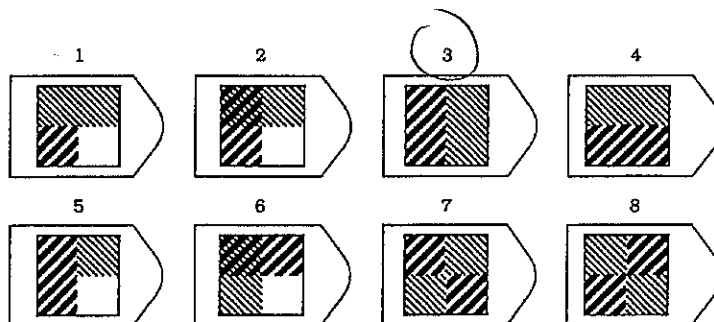
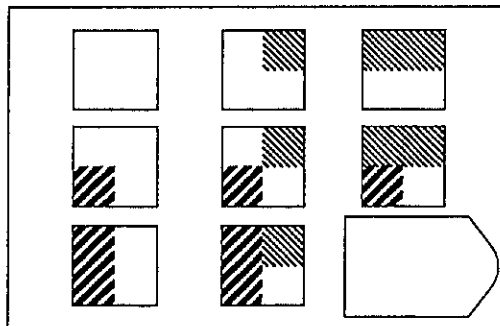
PATTERN 3

6



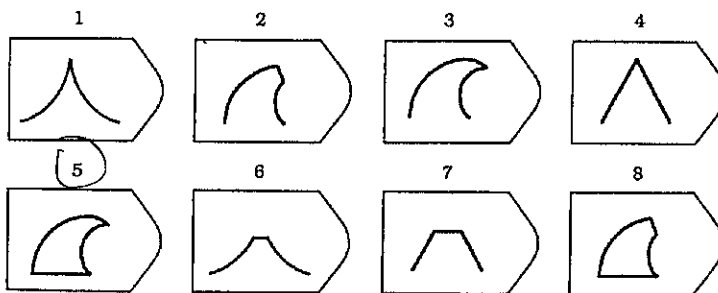
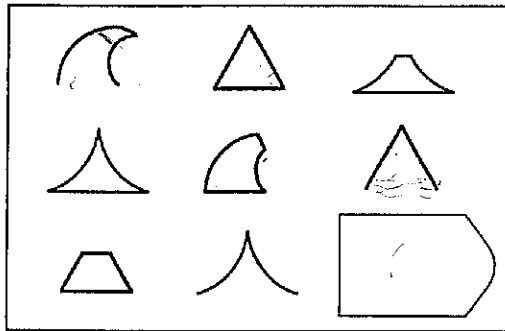
PATTERN 4

3



PATTERN 5

5



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Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

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PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet. B

A. While debugging their broken firewall, a programmer came across top-secret CIA files.

B B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.

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A A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

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C. Sean has been closely monitoring his eating in an attempt to improve his diet.

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PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class. **A**

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- A. Dew forming. They are similar because they both involve a drop in temperature.
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DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 48823

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☒ African American/Black
- ☐ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: 4221391
Version A

GROUP: C20

40

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
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ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?
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☒ b. The reservoir is not in equilibrium.
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☐ b. Reflection of more solar radiation, causing atmospheric temperature to increase
☐ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
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9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- D ☐ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
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- D ☐ a. The Earth's atmosphere would become colder than it is today.
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☒ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

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- Discussion of both negative and positive feedback loops to the process of ocean acidification.

an increase of CO_2 into the atmosphere would *explain*
cause an increase in the ocean acidification as well.
→ This would cause ocean temperatures to rise, which
is a positive feedback because it would increase
the earth's temperature. A negative feedback that
could occur would be an increase in evaporation
which would form more clouds in the atmosphere
blocking the sun's rays cooling the earth.

5

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

type
The greenhouse effect is the process by which the earth's atmosphere is heated. It allows some rays from the sun into the atmosphere which can then be absorbed by the Earth's surface while others are reflected back into space which do not heat up the atmosphere.

how
The ash from many volcanoes would block rays coming into the atmosphere from the sun causing the Earth to become colder however the increase in CO₂ in the atmosphere would trap more heat causing the Earth to become warmer. There would be a mixture of positive and negative feedbacks so it is impossible to predict if the Earth would become warmer or colder.

~~15~~ 15

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Earn up to 1 additional point on your course grade

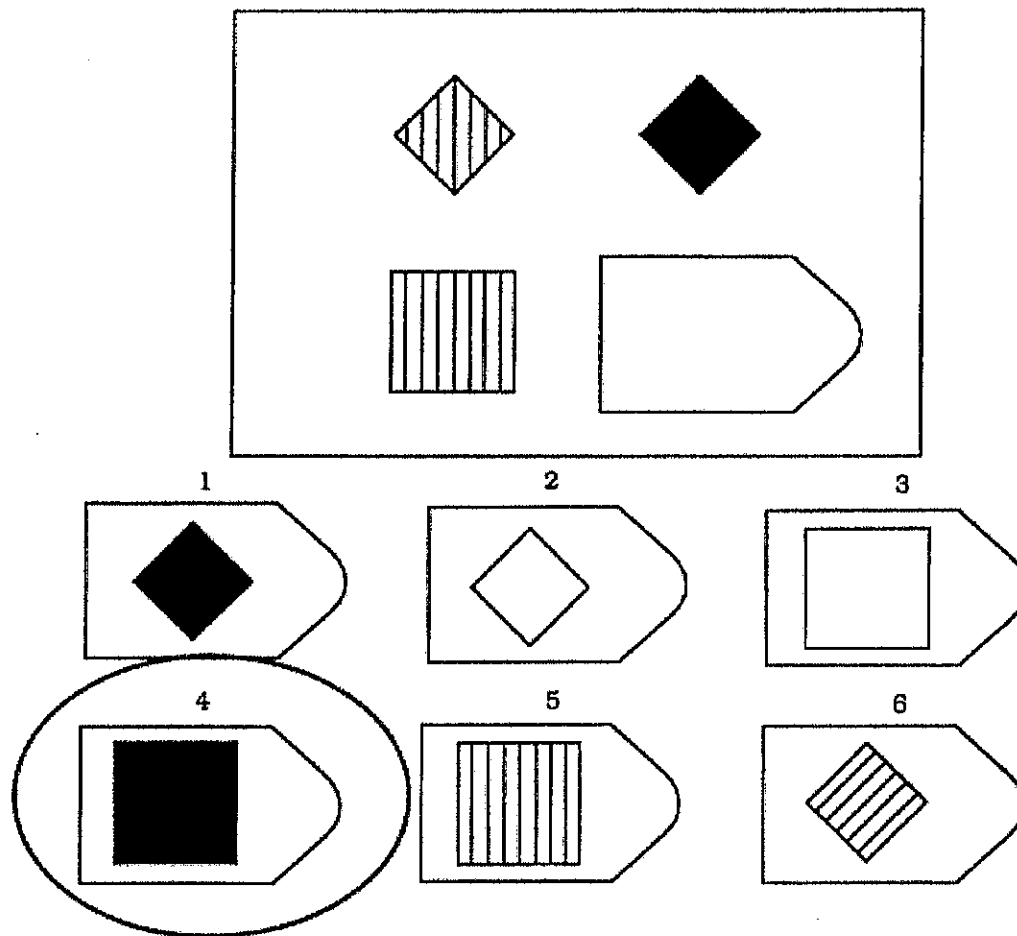
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

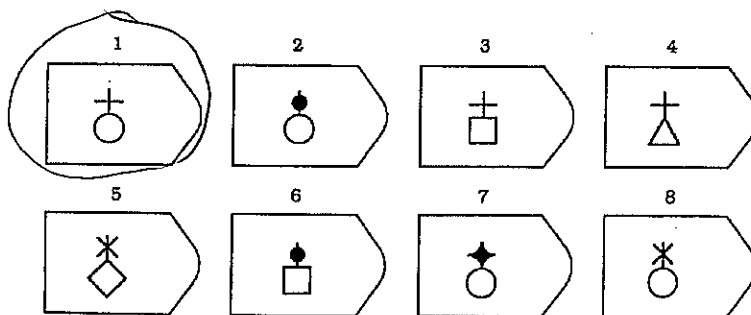
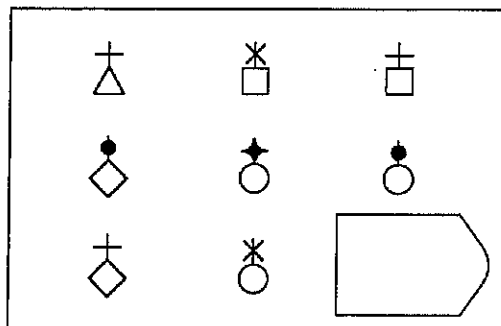


Answer: 4

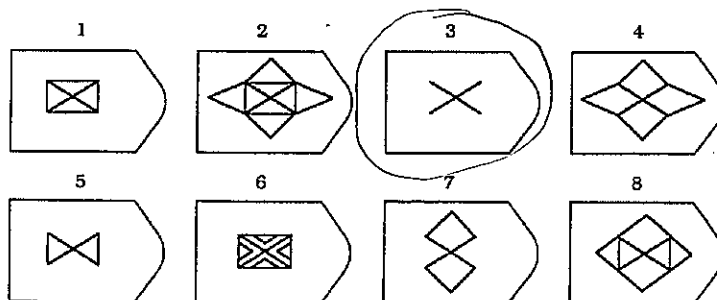
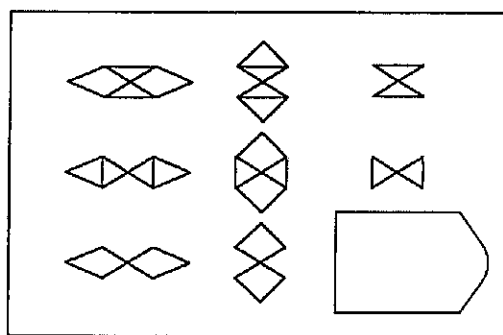
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Please choose the image that best completes each of the following patterns.

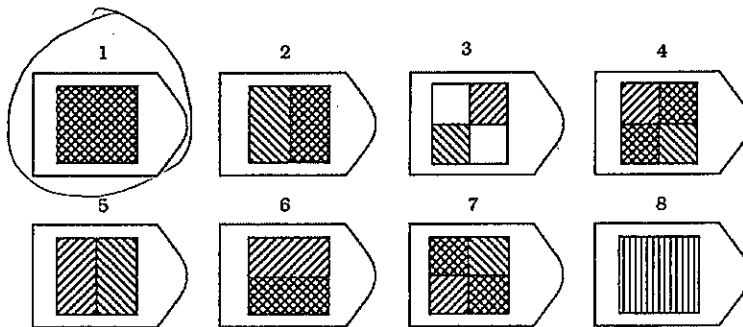
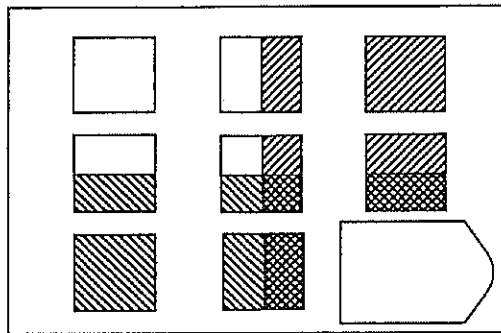
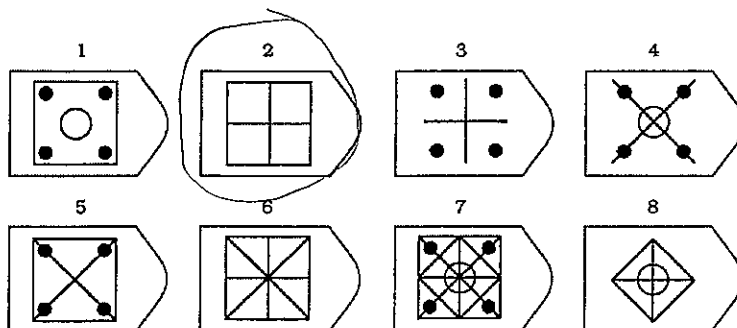
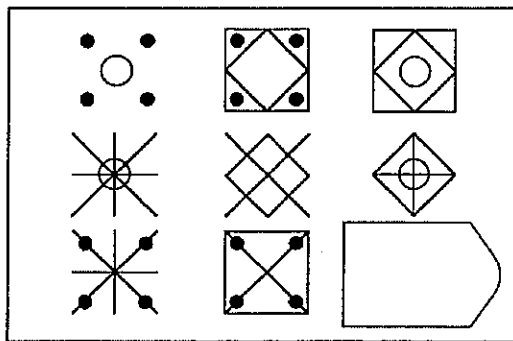
PATTERN 1



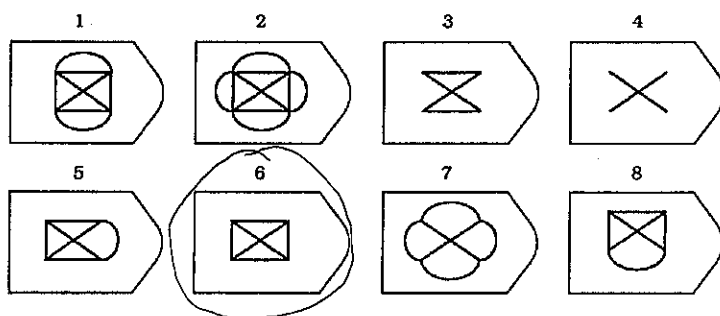
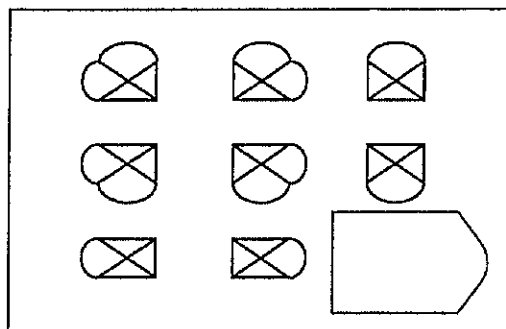
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

- A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.
- B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
- ☒ C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
- D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
- B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
- ☒ C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
- ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

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- ☒ B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
- C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
- D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

- A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
- B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
- ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
- D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- B. A leaf in the air. They are similar because they both move through the air carried by the wind.
- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- ☒ A. Getting the flu. They are similar because they are both caused by viruses.
- ☒ B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48462

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A41918010
Version A

GROUP: C20

80

MULTIPLE-CHOICE. 5 points each (50 points total).

- b. 1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - ☒ b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
- c. 2. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
- c. 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition
- b. 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - ☒ b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
- a. 5. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
- b. 6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
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 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.
- inflow = outflow

- b. 7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
- a. 8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- c. 9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
- b. 10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
 - ☒ b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Ocean acidification is the process in which CO_2 from the atmosphere dissolves, or goes through gas dissolution, into ocean water. The CO_2 reacts with the water, or H_2O , to form calcium bicarbonate, HCO_3^- , and hydrogen ions, H^+ . The hydrogen ions are acidic, which is the reason why the oceans become acidic when more CO_2 is dissolved into them.

If atmospheric carbon dioxide were increased, more CO_2 would be dissolved into the ocean. The excess CO_2 would create even more hydrogen ions, increasing the acidity of the ocean.

Positive feedback loops are changes that cause more change in the same direction. Negative feedback loops are changes that slow down, or stop a process completely.

In terms of ocean acidification, a positive feedback loop occurs because more CO_2 in the water would mean more could be evaporated into the atmosphere. This increases CO_2 in the atmosphere and starts the process all over again.

However, there needs to be some sort of balance and this comes into play with a negative feedback loop. If there is increased levels of CO_2 in the atmosphere, the ocean temperature would rise. A warmer ocean, can't hold as much CO_2 because of increased evaporation. So, this helps slow the process of acidification down.

25

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

Volcanism, or degassing, is the process where magma erupts and releases carbon dioxide back into the atmosphere. The increase in CO_2 should increase global temperature because of the Greenhouse effect. The Greenhouse effect is a naturally occurring process that is influenced by humans. Visible light enters the atmosphere. Some of these infrared waves are absorbed by earth's surface, heating our planet. Other are reflected back and can either be readmitted into space or absorbed by Greenhouse Gases. Common Greenhouse Gases are water vapor, methane and, most importantly, CO_2 . These gases trap heat inside our atmosphere, +? So, volcanism can raise our temperatures significantly by admitting a bit of CO_2 into the atmosphere. However, a semi-balance is formed because of the large ash clouds. These ash clouds prevent some sunlight and infrared rays from entering the atmosphere, having a cooling effect on our climate. Eventually though the ash clouds will settle out of the atmosphere, so overall, volcanism should cause an increase in atmospheric temperatures.

15

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

They are similar because they both turn a liquid like substance into a gas. But, they're different because evaporation occurs with water and degassing with magma.

Earn up to 1 additional point on your course grade

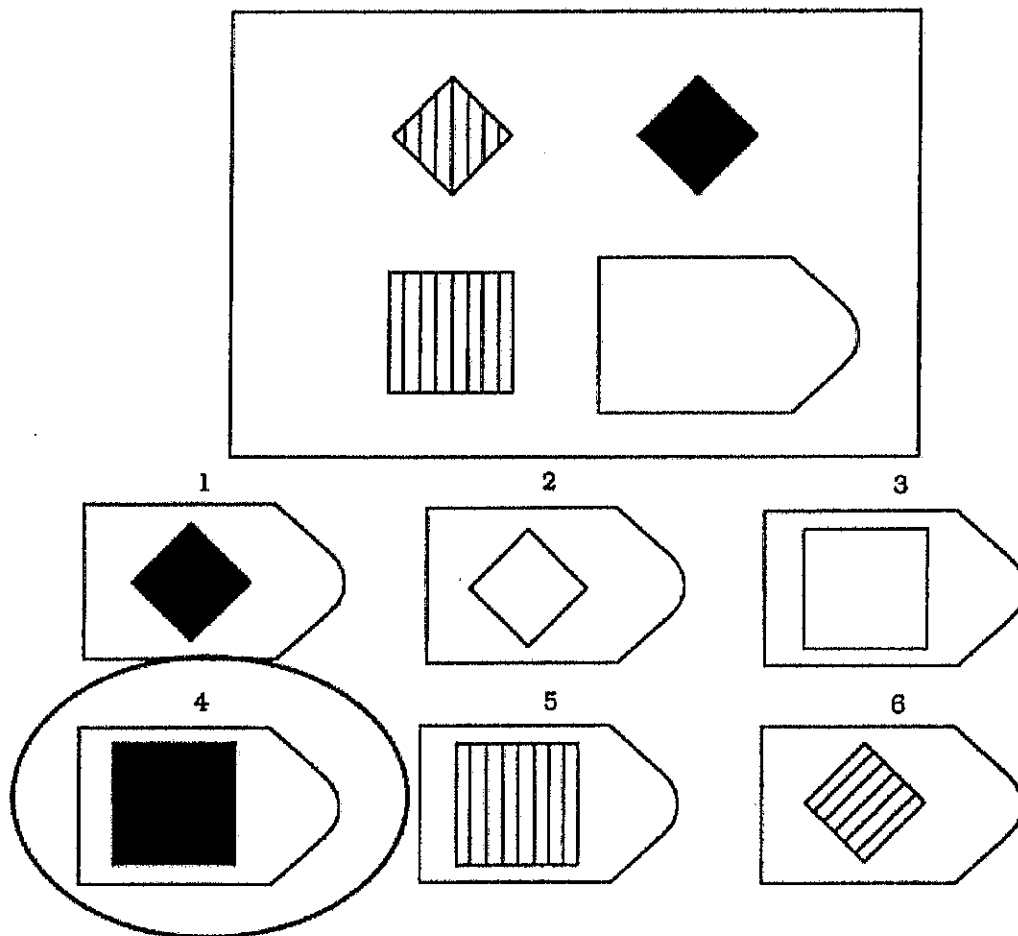
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

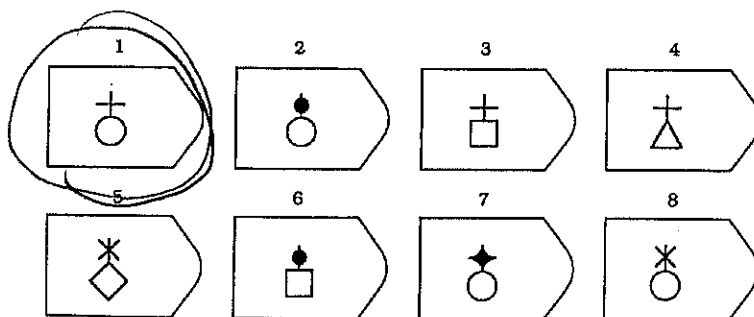
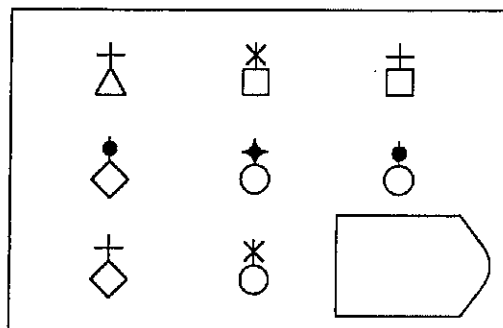


Answer: 4

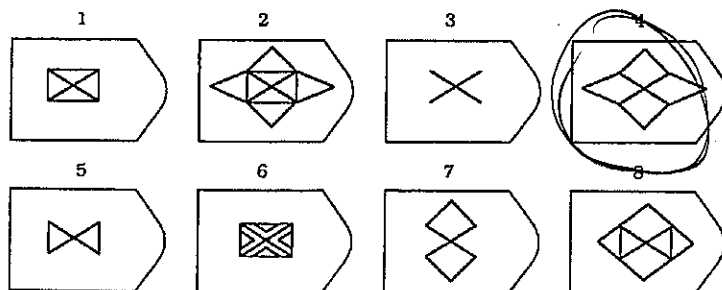
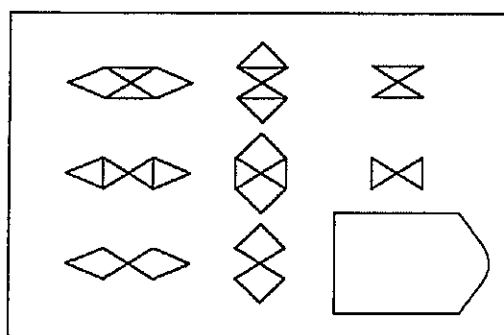
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PATTERN 1

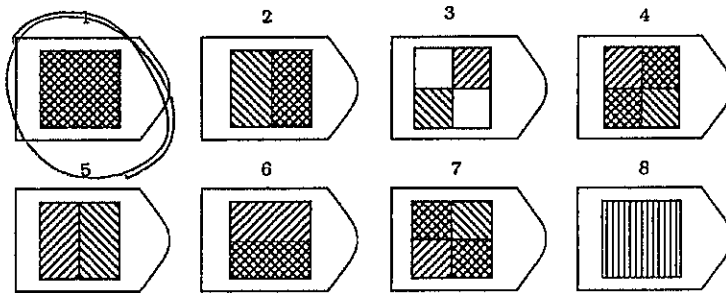
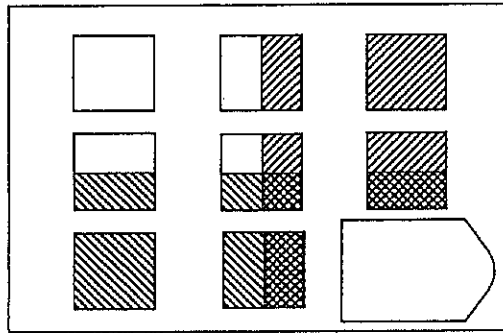


PATTERN 2

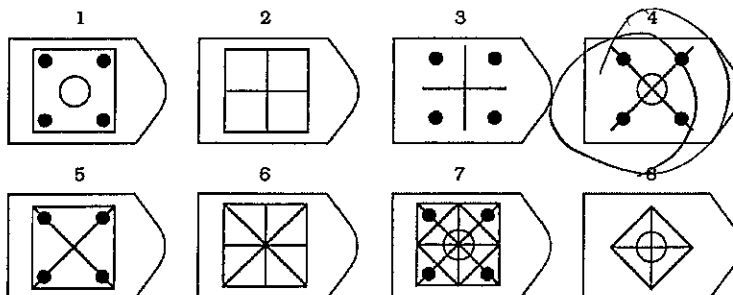
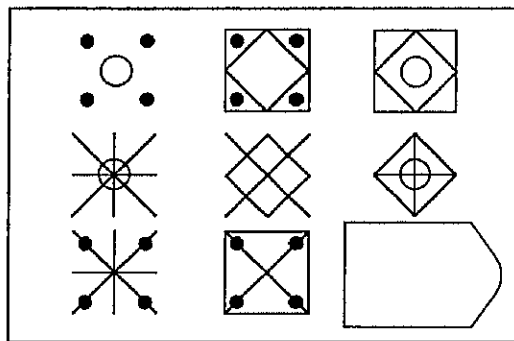


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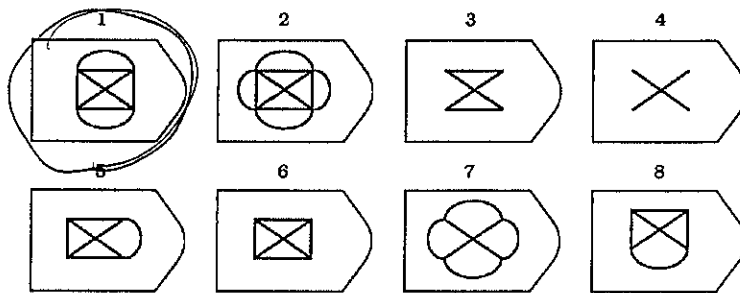
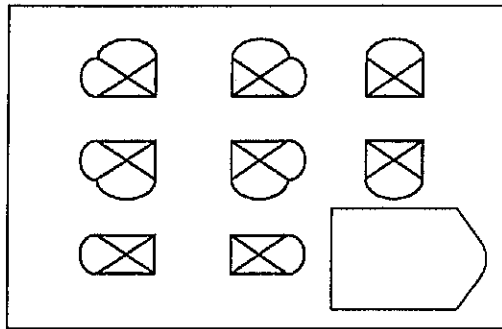
PATTERN 3



PATTERN 4



PLEASE CONTINUE ON NEXT PAGE

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PLEASE CONTINUE ON NEXT PAGE

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 - D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.
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 - C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
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PLEASE CONTINUE ON NEXT PAGE

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-

Please choose the response that is closest to an analogy that you might make.

- A. 1. A balloon floating is like...
- A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
 - B. A leaf in the air. They are similar because they both move through the air carried by the wind.
 - C. Blowing bubbles. They are similar because they both float until they eventually pop.
 - D. A cloud in the sky. They are similar because they both float and are carried by the wind.
- A. 2. Catching a cold is like...
- A. Getting the flu. They are similar because they are both caused by viruses.
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 - D. Forgetting to do your homework. They are similar because they are both preventable.
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DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48128

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☒ Caucasian
☐ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☐ Other

STUDENT NAME: A41850835
Version B

GROUP: C20

71

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - ☒ c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- a. A = erosion, B = deposition, C = uplift and erosion
 - b. A = erosion, B = biochemical precipitation, C = uplift and deposition
 - ☒ c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
 - d. A = dissolution, B = deposition, C = uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - ☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
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- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

1. I think it would create a blocking cloud, looking at solar energy from sun, lead to decreased temp. this is negative

141850835

- B 7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
- D 8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
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- X 9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
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 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
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- B 10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
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K41850835

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide would lead to more CO_2 in the oceans. With this increase in ocean CO_2 , the ocean water's pH will ~~increase~~. A pH ~~increase~~ signifies an increase in ocean acidification.

As I have just explained, this would be a positive feedback loop. A positive feedback continues a process without slowing down or stopping.

24

HOWEVER...

An increase in atmospheric CO_2 would lead to increase temperatures in addition more CO_2 in oceans. If temperatures increase, ocean water will be warmer. Molecules move faster in warmer water; and w/ faster molecules, CO_2 can not easily be ~~exit~~ admitted in ocean (it will kick it back out). That is why cooler waters hold more gases like CO_2 .

This explanation illustrates a negative feedback. An increase in atmospheric CO_2 , creates warmer oceans. Warmer water slows down the process of admitting CO_2 in the ocean - overall slowing down ocean acidification.

111050835

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and ~~changes in atmospheric temperature.~~

If there was an increase in volcanism on Earth, this would release more greenhouse gases in the atmosphere. With more greenhouse gases in the atmosphere, there could be a significant increase in temperature on Earth. This would come from the greenhouse gases absorbing and re-radiating solar energy - HEAT X

AS: HOWEVER; if these volcanoes erupt large ash clouds, there would be a block in the atmosphere by the ash clouds. This would shut out radiating energy from the sun. With this period of volcanism erupting large ash clouds, the Earth's temperature would decrease.

10

2 Extra credit (2 points).
How are evaporation and degassing similar and/or different?

Similar bc both release gas into the atmosphere
Different bc degassing breaks to release gas from ~~and some other of~~ liquid matter into a gas

Earn up to 1 additional point on your course grade

[ex. a 79% becomes an 80%]

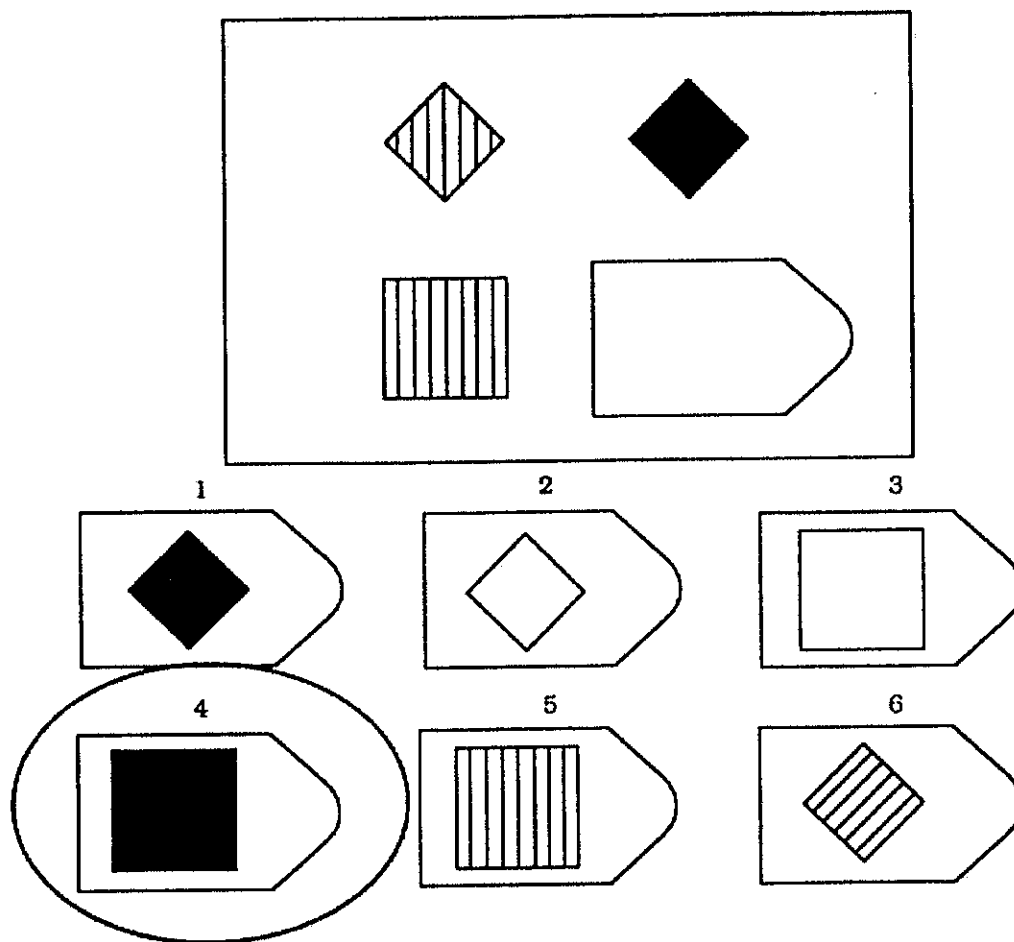
Thoughtfully complete the attached survey

141850835

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example



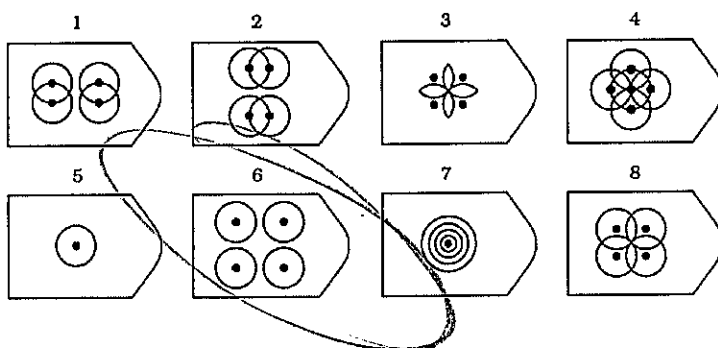
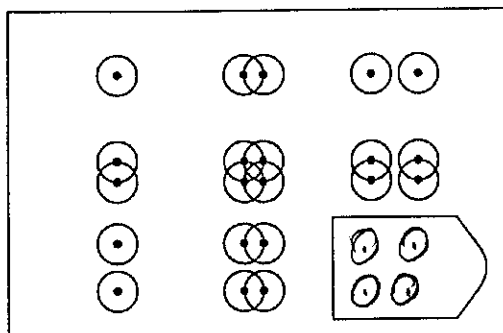
Answer: 4

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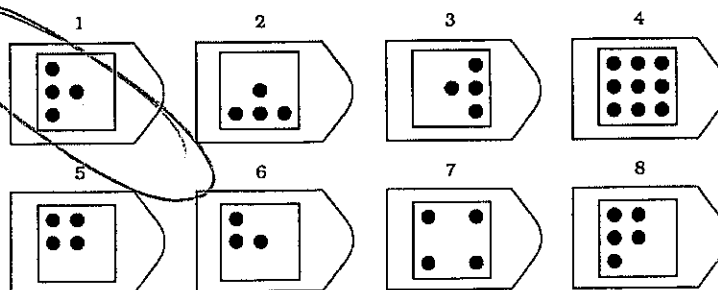
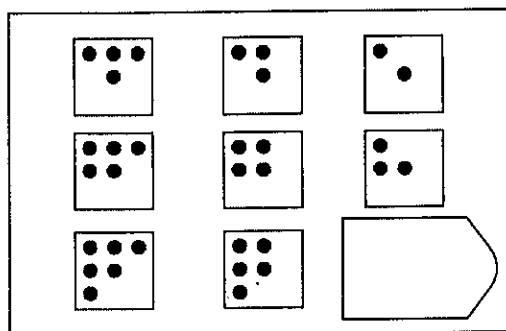
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Please choose the image that best completes each of the following patterns.

PATTERN 1



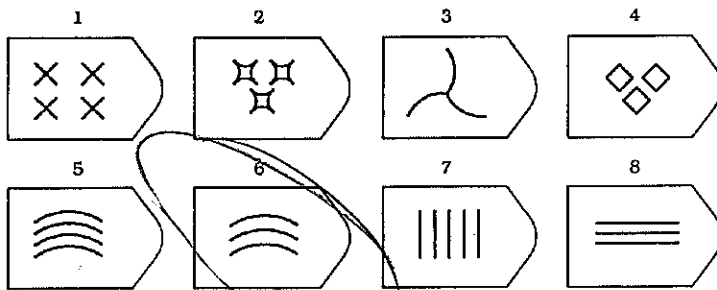
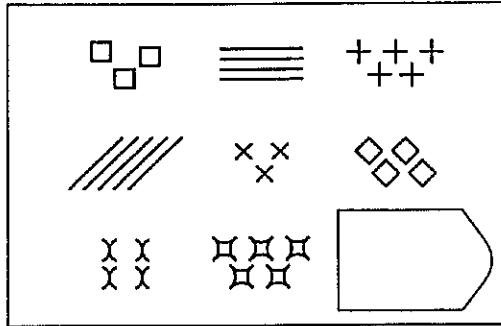
PATTERN 2



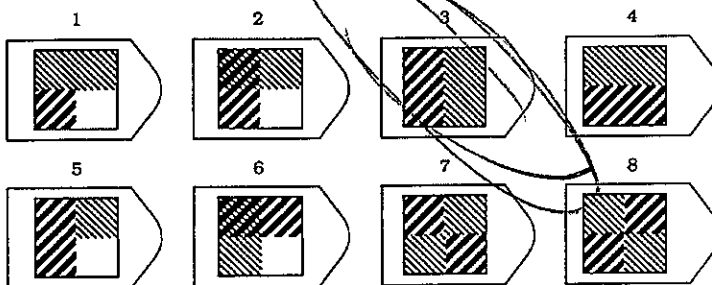
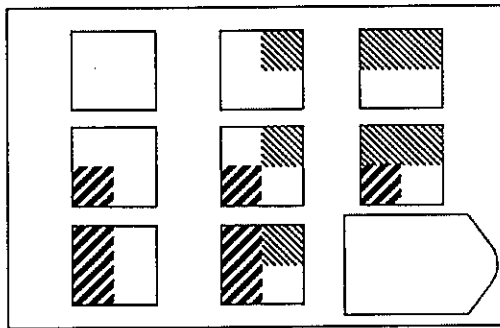
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PATTERN 3

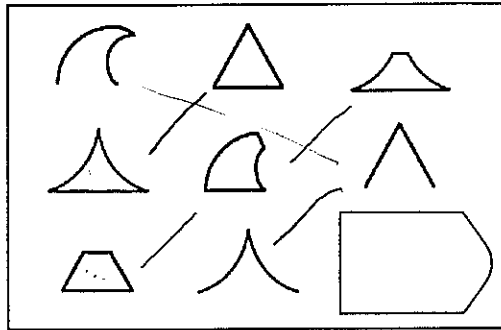


PATTERN 4

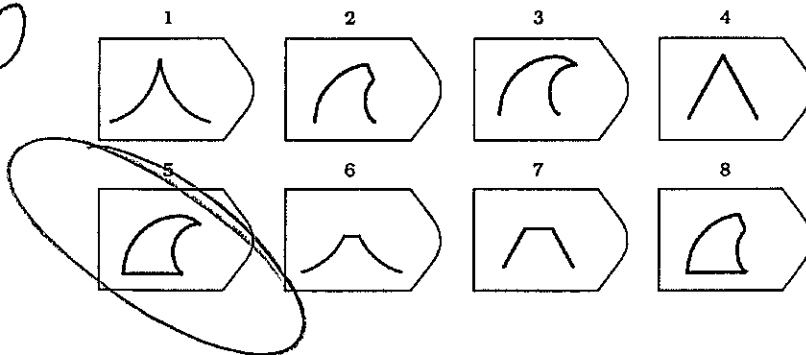


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PATTERN 5



#5



In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

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K41950835

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

A. While debugging their broken firewall, a programmer came across top-secret CIA files.

B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.

C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.

D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.

C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.

D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

B. Bob was able to maximize his work time by cutting back on watching TV during the day.

C. Sean has been closely monitoring his eating in an attempt to improve his diet.

D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

C. Once he saw everyone else's formal suits, Dan went home to change clothes.

D. When she heard the forecast, Jen became concerned about her plans for the weekend.

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K11850835

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- ☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
- ☐ B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
- ☐ C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
- ☐ D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- ☐ A. Getting high. They are both involve too much of a chemical influencing the body.
- ☐ B. Hitting your head. They both involve something that causes headaches.
- ☐ C. Being sleep deprived. They both involve impaired functions.
- ☐ D. Eating too much candy. They both involve lack of self-control.
- ☐ E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- ☐ A. Dew forming. They are similar because they both involve a drop in temperature.
- ☐ B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☐ C. Clouds forming. They are similar because they both involve a phase change.
- ☐ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 480915

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☐ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☒ Other

STUDENT NAME: A43332855
Version A

GROUP

C20

53

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- D
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - ☒ d. Crystals forming in the magma

A

2. Which of the following would be considered a negative feedback to increasing global temperature?

- ☒ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
- b. Melting of permafrost resulting in more methane escaping into the atmosphere
- c. An increase in evaporation and cloud formation resulting in the release of latent heat
- d. An increase in desert formation resulting in more dusting blowing into the atmosphere

C

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- a. A= erosion, B= deposition, C= uplift and erosion
- b. A = erosion, B= biochemical precipitation, C= uplift and deposition
- ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
- d. A = dissolution, B= deposition, C= uplift and deposition

C

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- a. Human activities are the primary cause of the greenhouse effect.
- b. Natural processes are the primary cause of the greenhouse effect.
- ☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
- d. Neither human activities nor natural processes are important causes of the greenhouse effect.
- e. The human and natural causes of the greenhouse effect are not understood.

A

5. Which of the following would cause the acidity of Earth's oceans to decrease?

- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
- b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
- c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

B

6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- a. Reservoir A has a shorter residence time than Reservoir B.
- ☒ b. Reservoir B has a shorter residence time than Reservoir A.
- c. Reservoir A and Reservoir B have equal residence times.
- d. More information about Reservoir A and Reservoir B is needed.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- B
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.

8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- B
- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ☒ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- A
- ☒ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- A
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in the atmospheric carbon dioxide would increase ocean acidification

First CO_2 in the atmosphere is converted into CO_2 in the oceans. Then CO_2 and H_2O in the oceans combine to form calcium and hydrogen ions. These ~~calcium~~ and hydrogen ions increase acidity by (creating more CO_2 through the process of weathering)?

The positive feedback loop is that an increase in ocean acidification would still increase CO_2 in the atmosphere. The negative feedback loop is that more CO_2 in the oceans would increase in temperature in the atmosphere.

4?

10

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

An increase in volcanism would affect Earth's atmospheric temperature by increasing it. The greenhouse effect is when the sun sends solar radiation down to the earth. Then the earth absorbs the radiation and reflects ~~x~~ visible light back into the atmosphere and infrared light to the greenhouse gases. There the greenhouse gases convert ~~x~~ same infrared light into heat and re-emit heat into earth's atmosphere, so if volcanism increased that would mean greenhouse gases would increase resulting in more heat converted and re-emitted into earth's atmosphere thus increasing earth's atmospheric temperature.

10

Extra credit (2 points):

How are evaporation and degassing similar and/or different?

They are similar because they require thermal energy.

Earn up to 1 additional point on your course grade

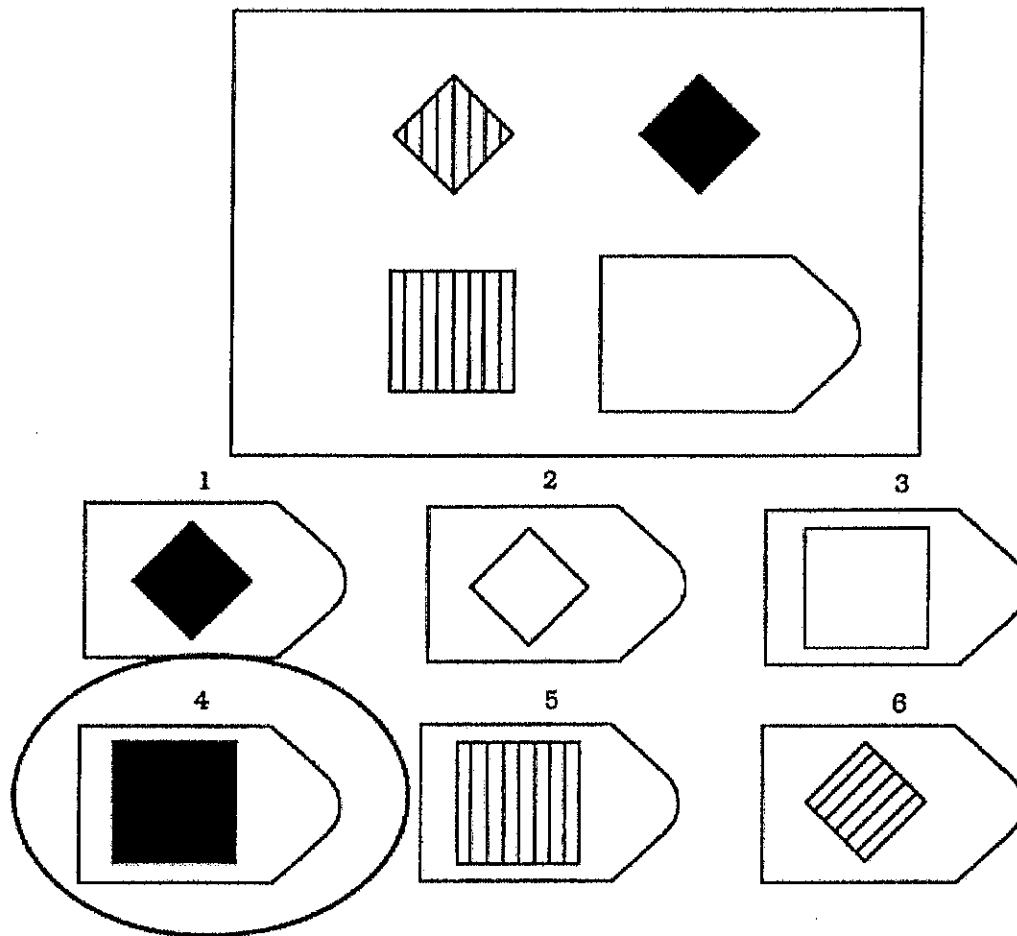
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

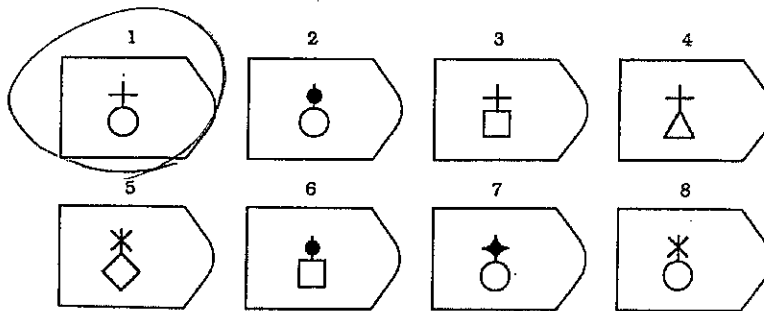
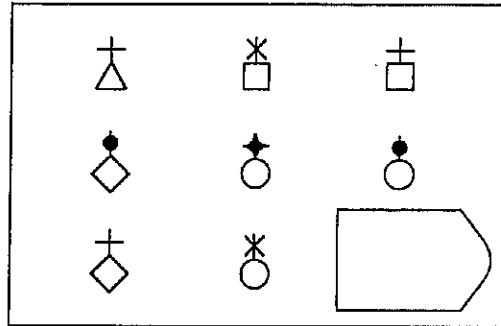


Answer: 4

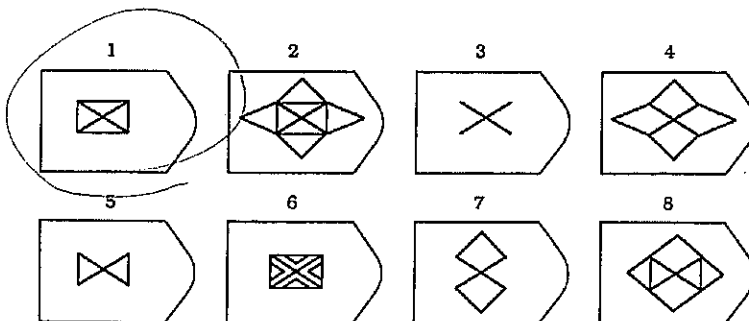
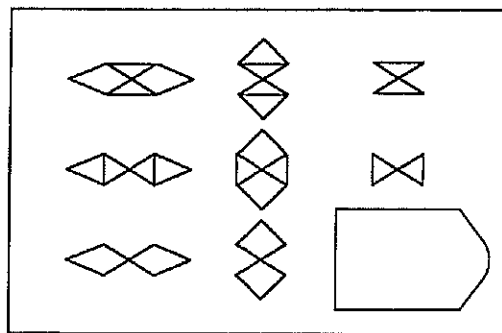
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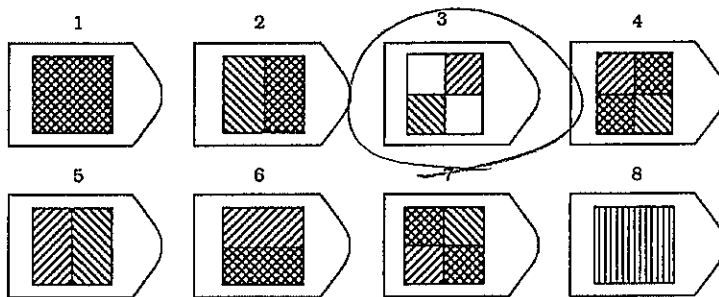
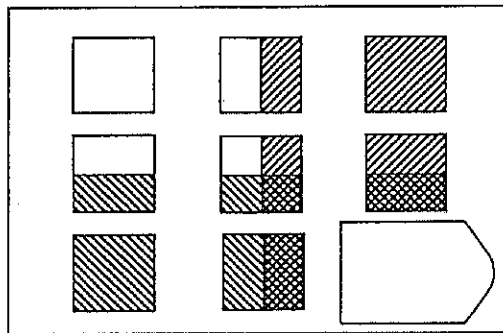
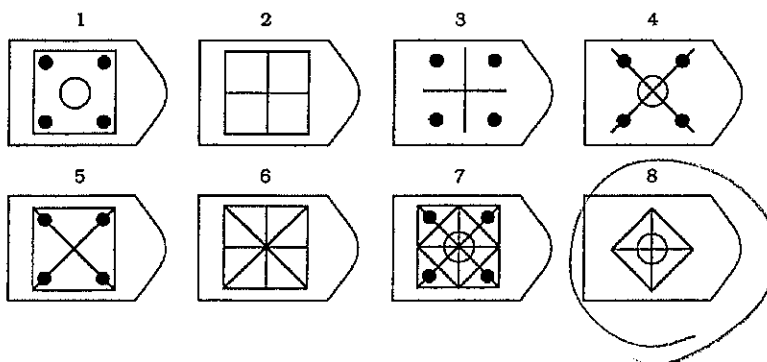
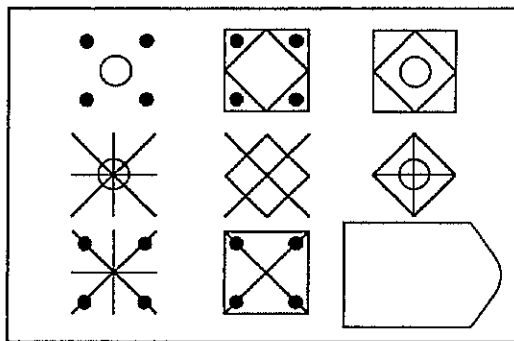
Please choose the image that best completes each of the following patterns.

PATTERN 1

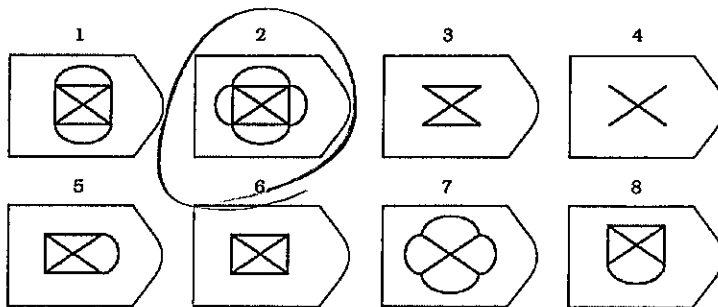
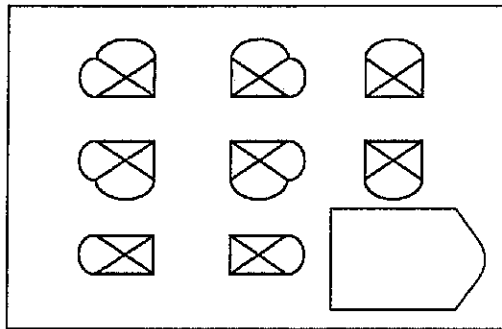


PATTERN 2



PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.

B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.

☒ C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.

D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

A. Before the annual parade, the city council decided to renovate one of the buildings downtown.

B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.

C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.

☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.

☒ B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.

C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.

D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

A. The toddler wrote on the walls with pens when the babysitter wasn't looking.

B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.

☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.

D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - ☒ B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...
- A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
 - ☒ B. A leaf in the air. They are similar because they both move through the air carried by the wind.
 - C. Blowing bubbles. They are similar because they both float until they eventually pop.
 - D. A cloud in the sky. They are similar because they both float and are carried by the wind.
2. Catching a cold is like...
- A. Getting the flu. They are similar because they are both caused by viruses.
 - B. Getting pink eye. They are similar because they are both contagious.
 - C. Getting the flu. They are similar because they are both caused by not washing your hands.
 - D. Forgetting to do your homework. They are similar because they are both preventable.
 - ☒ E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 18 years

What is your home zip code? 48025

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A43535121
Version B

GROUP: C21

78

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - Melting of permafrost resulting in more methane escaping into the atmosphere
 - An increase in evaporation and cloud-formation resulting in the release of latent heat
 - An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- The magma becoming colder
 - Gas bubbles forming in the magma
 - The surrounding crust becoming hotter
 - Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- A= erosion, B= deposition, C= uplift and erosion
 - A= erosion, B= biochemical precipitation, C= uplift and deposition
 - A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - A= dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- Human activities are the primary cause of the greenhouse effect.
 - Natural processes are the primary cause of the greenhouse effect.
 - Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - Neither human activities nor natural processes are important causes of the greenhouse effect.
 - The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- Reservoir A has a shorter residence time than Reservoir B.
 - Reservoir B has a shorter residence time than Reservoir A.
 - Reservoir A and Reservoir B have equal residence times.
 - More information about Reservoir A and Reservoir B is needed.
6. Which of the following would cause the acidity of Earth's oceans to decrease?
- An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

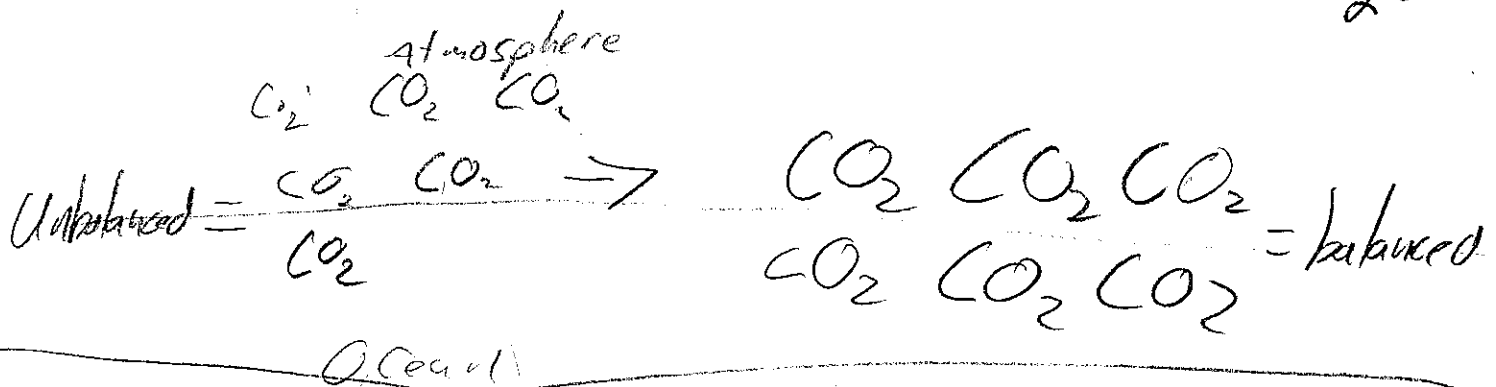
Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

The increase in carbon dioxide in the atmosphere would cause the acidification in the ocean to increase until they reached equilibrium.

A. CO_2 in the atmosphere also becomes CO_2 in the ocean to balance the equilibrium.

25



B. Positive = the more CO_2 in the atmosphere equals more CO_2 in the ocean which makes the ocean more acidic

Negative = The increase of CO_2 in the atmosphere equals increased atmosphere temperature which increases Ocean Temperature which decreases the amount of CO_2 the oceans can hold which decreased the Ocean Acidification.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The Temperature would decrease, because the ash would block out the sun's radiation.

A. The ash would block the sun's radiation which would decrease the earth's temperature. It would also increase CO_2 which would increase "Greenhouse Gases" which increase temperature because they absorb heat and redistribute the heat in all directions.

B. The Volcanism would increase ash and CO_2 , but since the sun's radiation doesn't penetrate the ash, the CO_2 has nothing to absorb to then warm the Earth. +?

18

Extra credit (2 points).

How are evaporation and degassing similar and/or different? They both release gas into the atmosphere, but evaporation happens because of thermal energy. Degassing happens to reach equilibrium.

Earn up to 1 additional point on your course grade

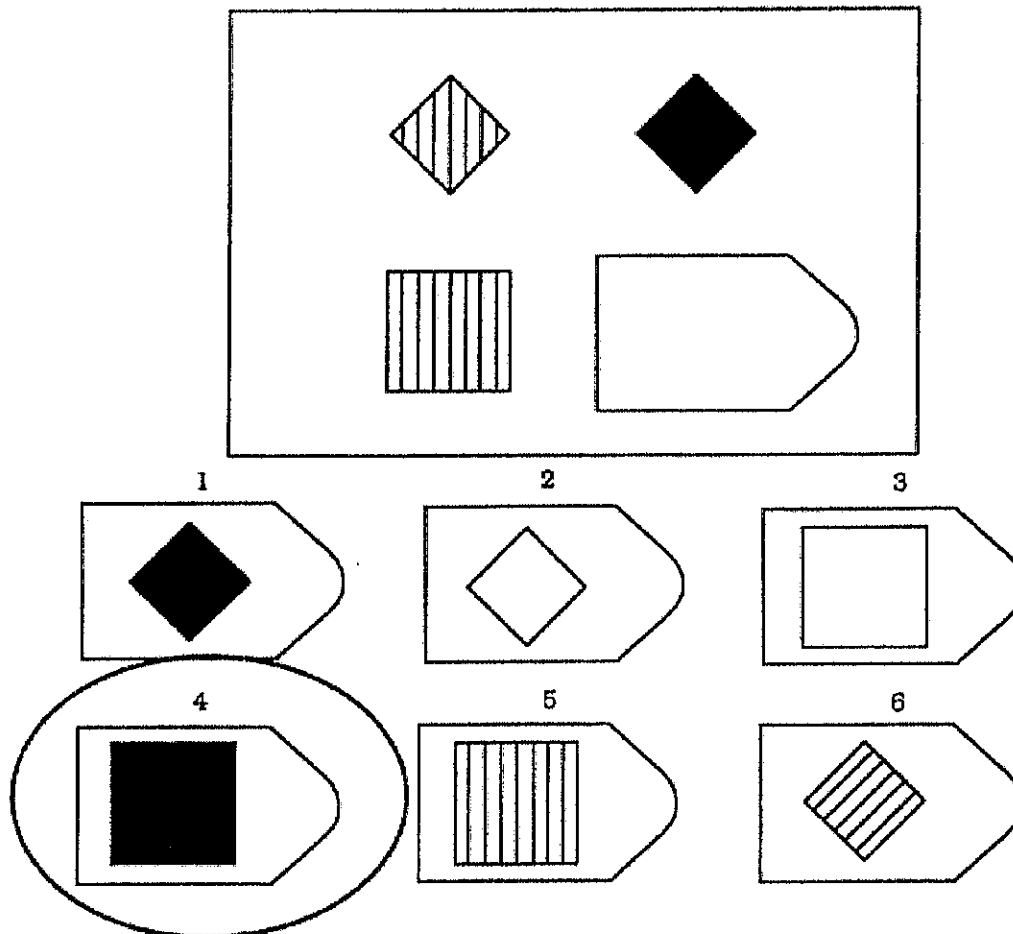
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

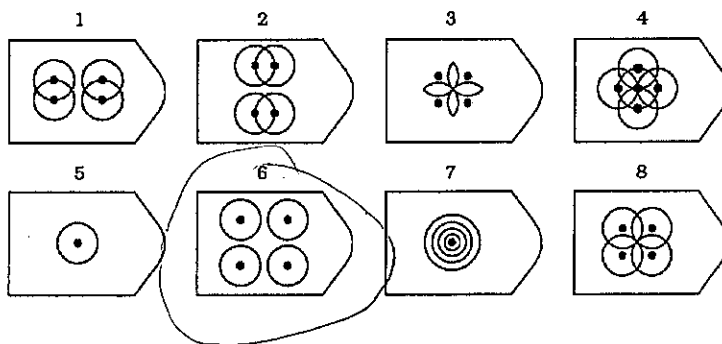
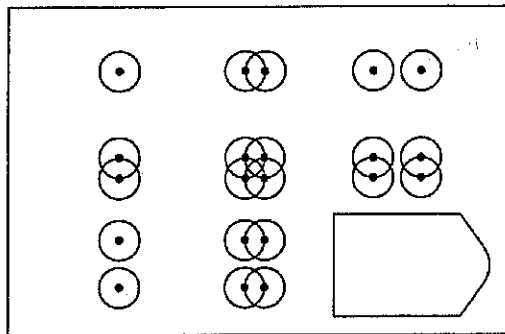


Answer: 4

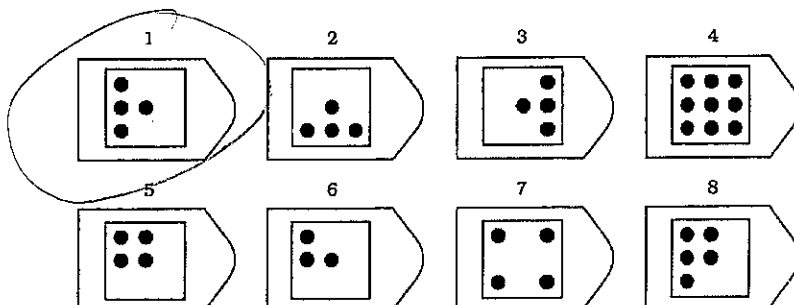
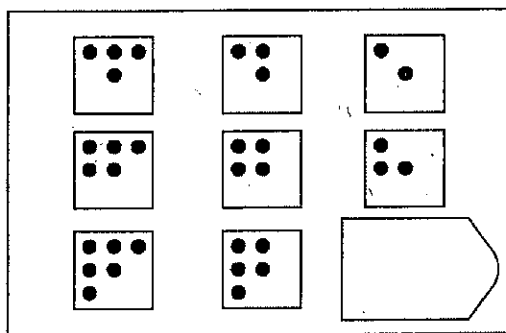
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

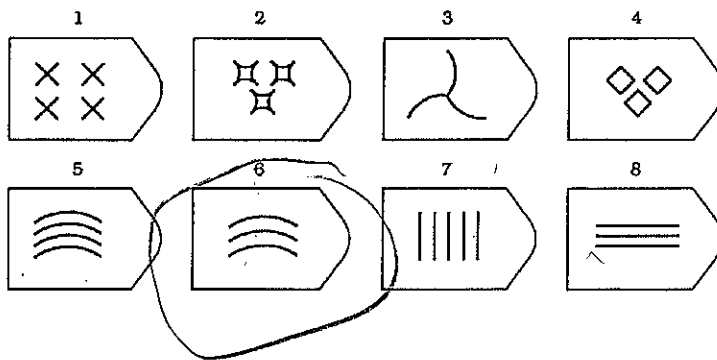
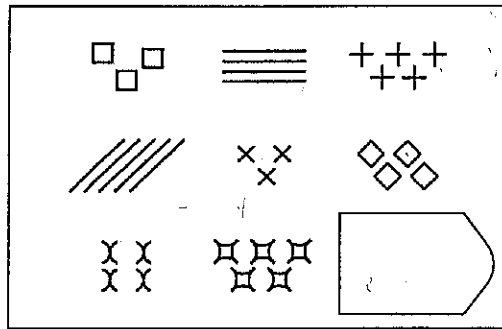
PATTERN 1



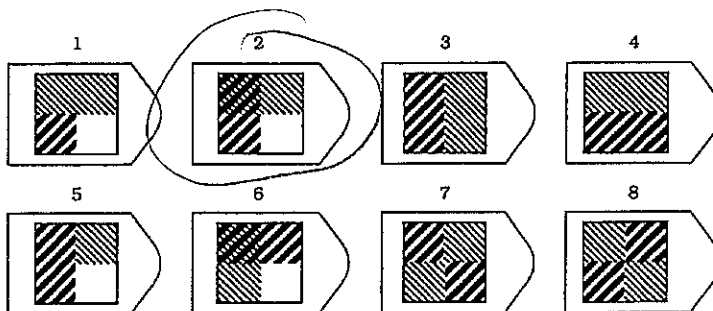
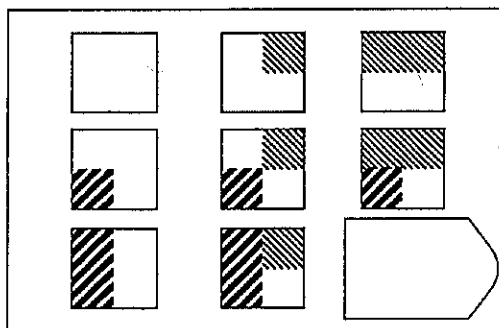
PATTERN 2

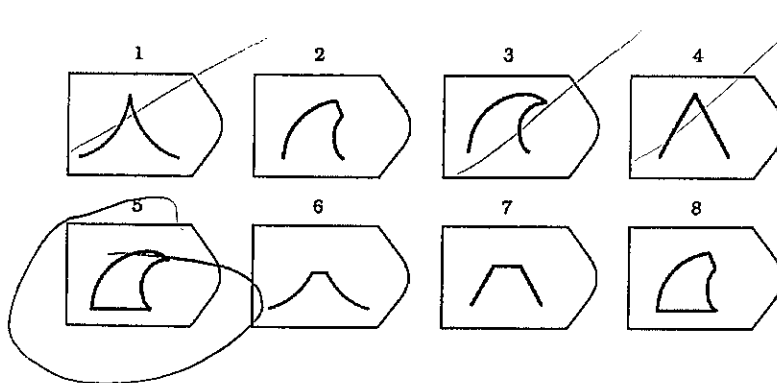
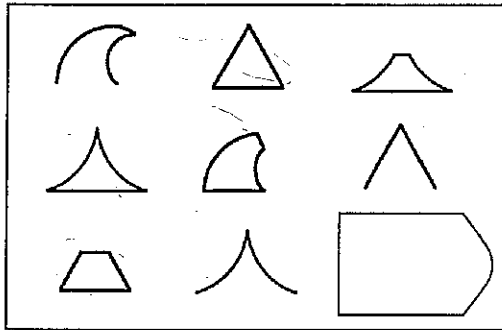


PATTERN 3



PATTERN 4



PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- A. While debugging their broken firewall, a programmer came across top-secret CIA files.
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- C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
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- D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- A. After eating a big lunch, Dan went back to his office and took a nap.
- B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
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 - D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

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- B. Hitting your head. They both involve something that causes headaches.
- C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 27 years

What is your home zip code? 48906

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

STUDENT NAME: A42271052
Version B

GROUP: C21

perfect

102

MULTIPLE-CHOICE. 5 points each (50 points total).

- Which of the following would be considered a negative feedback to increasing global temperature?
 - Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - Melting of permafrost resulting in more methane escaping into the atmosphere *positive*
 - An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☒ An increase in desert formation resulting in more dusting blowing into the atmosphere
temperature ↑ *temperature ↓*
- Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
 - The magma becoming colder
 - ☒ Gas bubbles forming in the magma
 - The surrounding crust becoming hotter
 - Crystals forming in the magma
- Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
 - A = erosion, B = deposition, C = uplift and erosion
 - A = erosion, B = biochemical precipitation, C = uplift and deposition
 - ☒ A = dissolution, B = biochemical precipitation, C = uplift and erosion
 - A = dissolution, B = deposition, C = uplift and deposition
- Which of the following statements about the greenhouse effect on Earth is most accurate?
 - Human activities are the primary cause of the greenhouse effect.
 - ☒ Natural processes are the primary cause of the greenhouse effect.
 - Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - Neither human activities nor natural processes are important causes of the greenhouse effect.
 - The human and natural causes of the greenhouse effect are not understood.
- Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
 - Reservoir A has a shorter residence time than Reservoir B.
 - ☒ Reservoir B has a shorter residence time than Reservoir A.
 - Reservoir A and Reservoir B have equal residence times.
 - More information about Reservoir A and Reservoir B is needed.

$T = V/q$ $B=5$ $A=10$ $(q)=2$
 $A(2) \quad \left| \begin{array}{l} T_A = 10/2 \\ = 5 \end{array} \right| \quad \left| \begin{array}{l} T_B = 5/2 \\ = 2.5 \end{array} \right|$
- Which of the following would cause the acidity of Earth's oceans to decrease?
 - ☒ An increase in ocean temperature due to an increase in atmospheric carbon dioxide. *eventually*
 - A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

Temperature inversely related to CO₂ containment



7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- a. ~~The reservoir will eventually disappear.~~
 b. ☒ The reservoir is not in equilibrium. $\text{influx} \neq \text{outflow}$ $T = V/q$ $\text{influx} > \text{outflow}$, therefore $\uparrow T$
 c. ~~The reservoir is growing smaller.~~
 d. ~~The reservoir's residence time is 10 years.~~ $V = 1000 \text{ km}^3$ $q = 100 \text{ km}^3/\text{year} - 50 \text{ km}^3/\text{year}$

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates? $\text{higher than natural rate}$ $\uparrow \text{CO}_2 \text{ concentrations}$

- a. ~~The Earth's atmosphere would become colder than it is today.~~
 b. ☒ The Earth's atmosphere would become warmer than it is today.
 c. ~~The Earth's atmosphere would remain about the same temperature as it is today.~~
 d. ~~The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.~~

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- a. ☒ Reflection of more solar radiation, causing atmospheric temperature to decrease.
 b. ~~Reflection of more solar radiation, causing atmospheric temperature to increase~~
 c. ~~Re-emitting of more infrared radiation, causing atmospheric temperature to increase~~
 d. ~~Re-emitting of more infrared radiation, causing atmospheric temperature to decrease~~

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- a. ~~Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.~~
 b. ☒ More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature. latent heat
 c. ~~Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.~~
 d. ~~More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.~~

Cloud formation reflects solar radiation.

✓

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

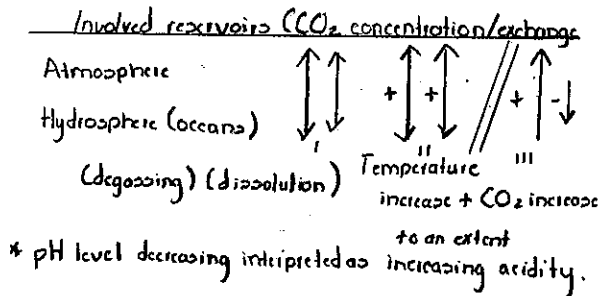
Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

$\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$	
CO_2	Carbon dioxide gas
H_2O	Liquid (ocean) water
HCO_3^-	Carbonic acid
H^+	Hydrogen ion; increase acidity.

Ocean acidification is a natural process which results from the exchange of carbon dioxide gas between the ocean and atmosphere.

An increased concentration of atmospheric carbon dioxide directly corresponds to an aggregate increase in atmospheric temperature. The ocean naturally contains dissolved carbon dioxide gas (represented by presented equation) in an equilibrium exchange. Increased quantities of dissolved carbon dioxide result in the presence of more carbonic acid and hydrogen ions (HCO_3^- ; H^+), essentially decreasing the pH level of ocean water. Reports concerning ocean acidification have discovered the overall pH level of Earth's oceans to have decreased from 8.25 to 8.13 since the mid-eighteenth century. However, negative feedback is associated with oceanic carbon containment and increased levels of carbon dioxide. An increase in aggregate atmospheric temperature in addition increases global water temperature. Warmer ocean water is less efficient at containing dissolved gases, and therefore, more carbon dioxide must be contained in the atmosphere as another reservoir (biosphere sequestration, lithosphere). The final supposed result is negatively correlated to oceanic containment, and positively correlated to increasing global temperature.



25

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

4

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

Involved reservoirs (temperature/composition)

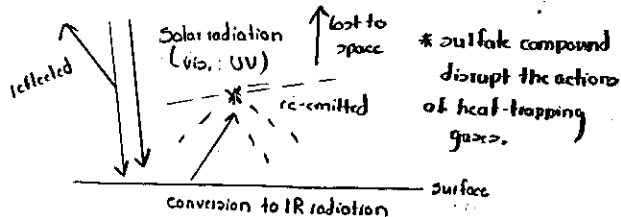
Lithosphere (volcanism)

Atmosphere

Scientific explanation:

A significant increase in volcanism (Earth's volcanic activity) may potentially have a variety of effects on Earth's natural systems. Foremost, the "greenhouse effect," which is responsible for containing heat in Earth's lower atmosphere utilizing heat-trapping gases (water vapor, carbon dioxide, methane) would be adversely affected. Volcanic ash contain large amounts of sulfur, in particular sulfur aerosols. The sulfur aerosols when dispersed throughout Earth's upper atmosphere have the tendency to "block" or reflect incoming solar radiation, working in direct opposition to heat-trapping gases. The understood outcome of an increase in atmospheric sulfur compound is therefore a relatively short period of atmospheric (troposphere) cooling. Earth's atmospheric temperature would steadily decline over the period of significant volcanism.

Heat-trapping gases (water vapor, carbon dioxide, methane, etc)
 Absorb infrared (IR) radiation emitted from the Earth's surface and re-emit the energy in all directions.



Historical explanation:

Historical events tend to support the scientific explanation of significant volcanic activity corresponding to cooler temperatures. Historical records include periods of below average temperatures referred to as "Little Ice Ages" during periods of intense volcanism.

25

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation and degassing are both means of transporting matter in a gaseous state.

However, evaporation is a phase change (i.e. liquid to gas) while degassing simply involves the release of a gas.

2

ID: A42271052

Earn up to 1 additional point on your course grade

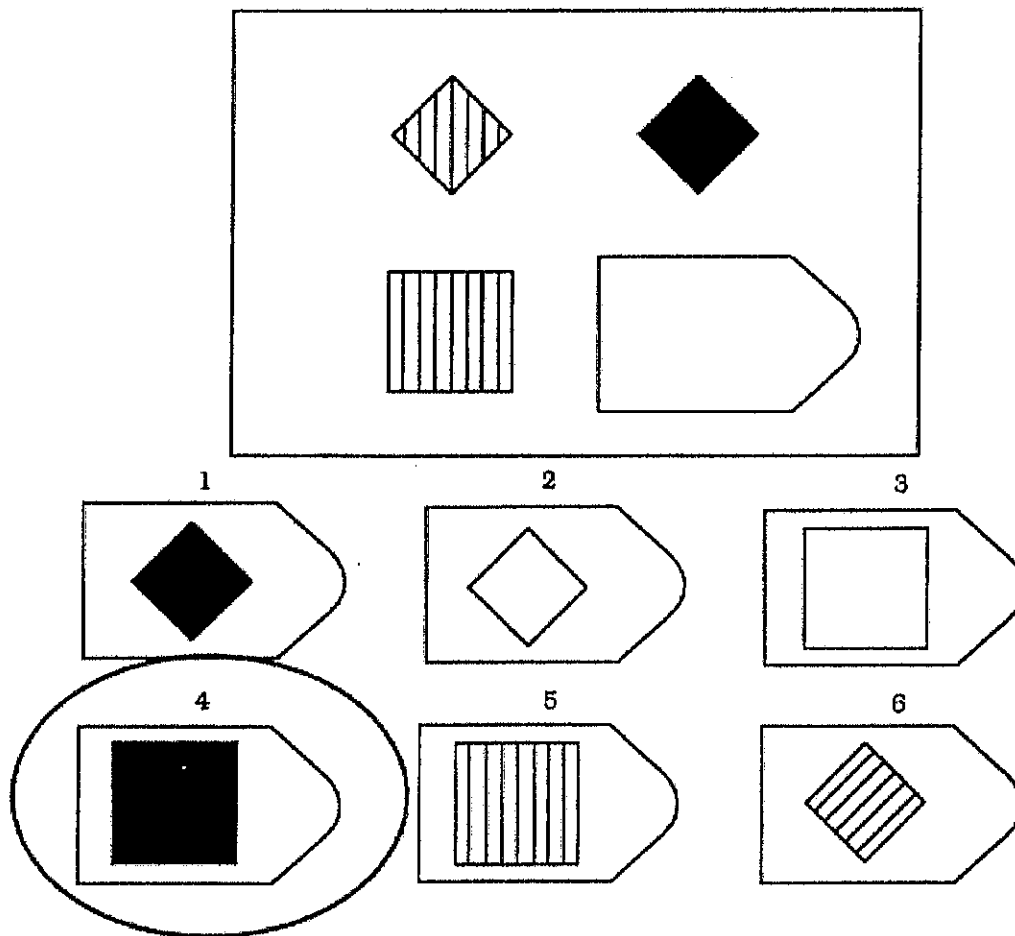
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Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

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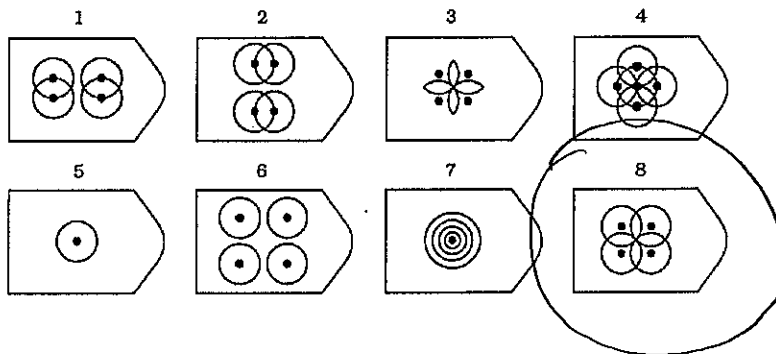
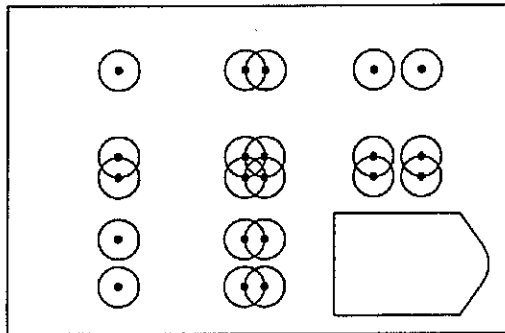


Answer: 4

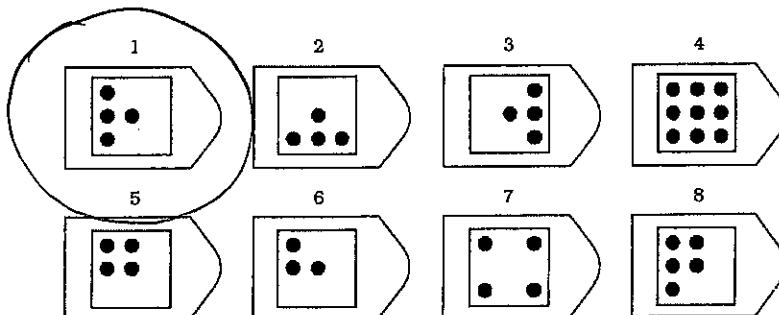
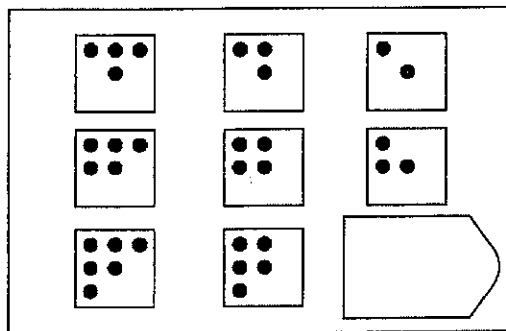
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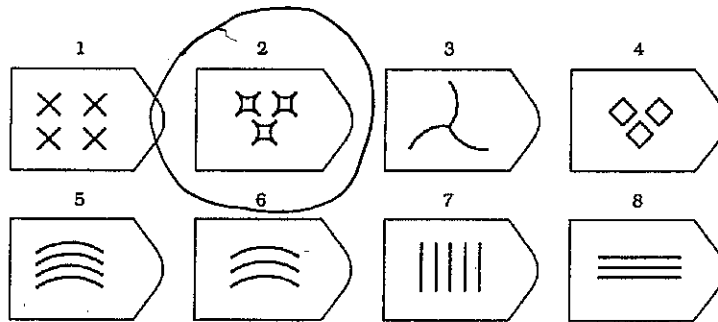
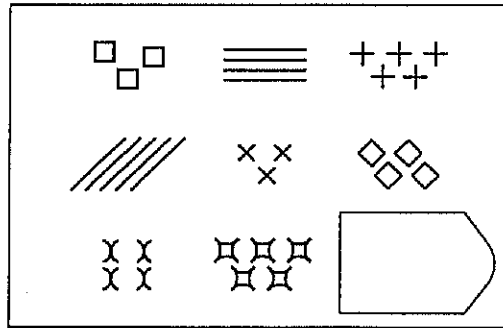
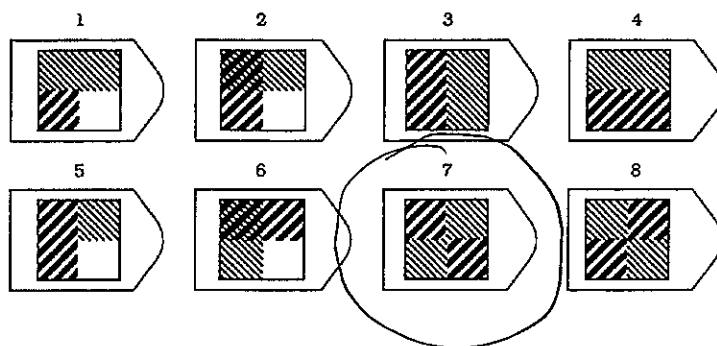
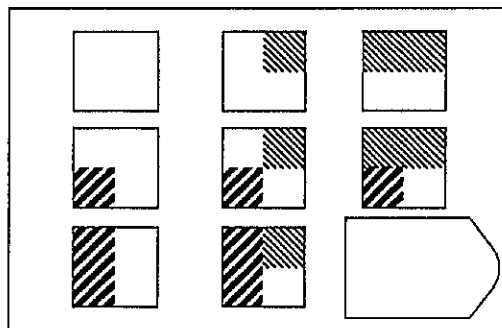
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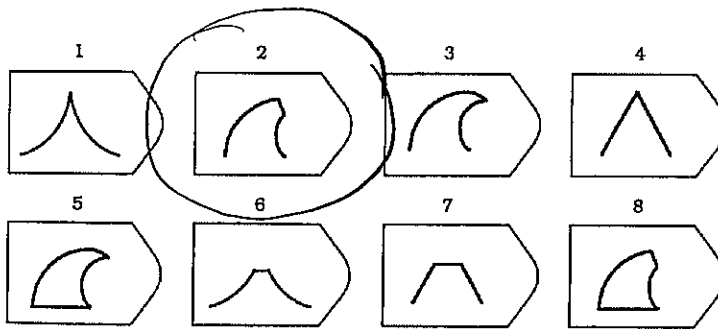
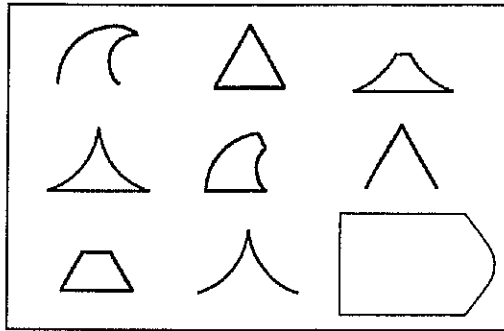
PATTERN 1



PATTERN 2



PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

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Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

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PLEASE CONTINUE ON NEXT PAGE

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2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

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- B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
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3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

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4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- A. After eating a big lunch, Dan went back to his office and took a nap.
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PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

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-

Please choose the response that is closest to an analogy that you might make.

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DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48309

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A 42134271
Version B

GROUP: C21

53

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
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2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
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 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

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4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
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5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
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6. Which of the following would cause the acidity of Earth's oceans to decrease?
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 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- a. The reservoir will eventually disappear.
- ☒ b. The reservoir is not in equilibrium.
- c. The reservoir is growing smaller.
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8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- a. The Earth's atmosphere would become colder than it is today.
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- d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- ☒ b. Reflection of more solar radiation, causing atmospheric temperature to increase
- c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
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10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- ☒ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
- b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.



An Increase in Atmospheric CO_2 would increase ocean acidification. CO_2 in the atmosphere goes to the hydrosphere which then becomes CO_3 and as it bonds with the water molecules it becomes calcium ? and H^+ in the oceans.

18

The positive feedback loop is that there is CO_2 in the atmosphere causing CO_2 in the oceans, both increasing Temperature.

The negative feedback is the increase in temperature causing more clouds to form, which causes more humidity, and rain.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

? An increase in volcanism would cause large ash clouds that would block most solar radiation from reaching the earth's surface. This would cause a decrease in earth's temperature. With less ^{visible} light passing through to the earth, the greenhouse effect would decrease, with atmospheric temperature decreasing, because less infrared light will be reflected back to the Atmosphere due to the ash cloud blockage. There would also reduce greenhouse gasses. ?

15

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Earn up to 1 additional point on your course grade

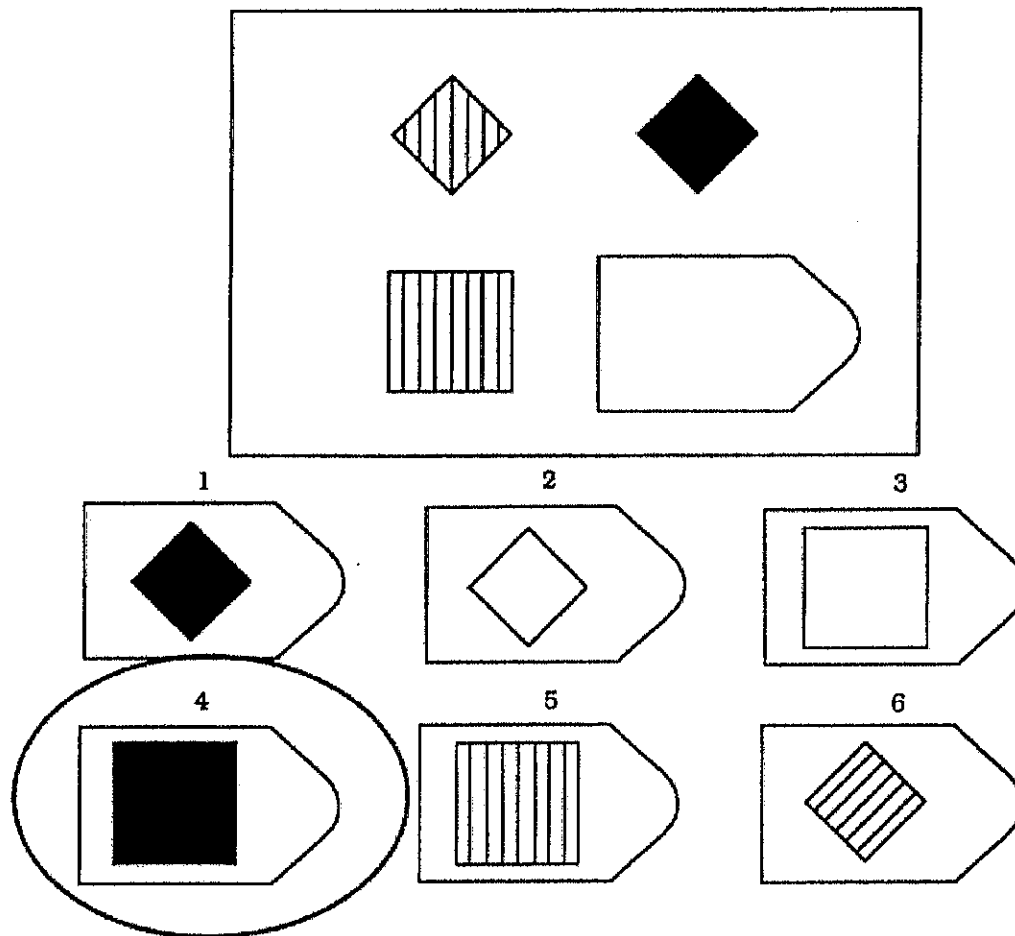
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example



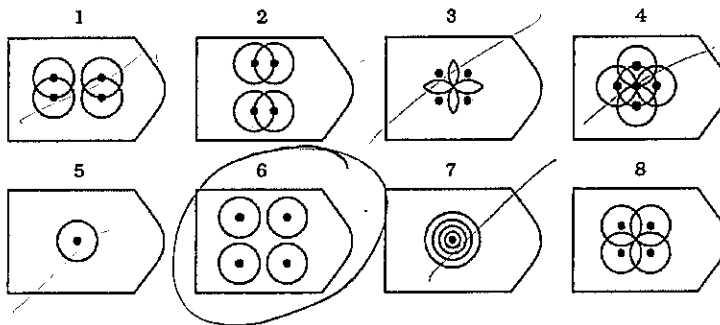
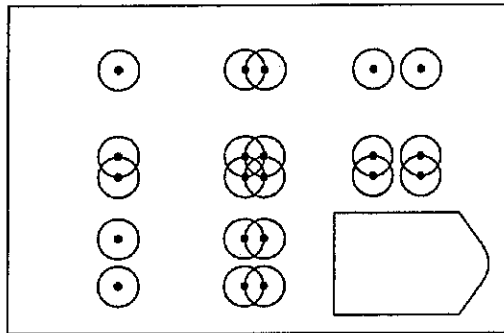
Answer: 4

PLEASE CONTINUE ON NEXT PAGE

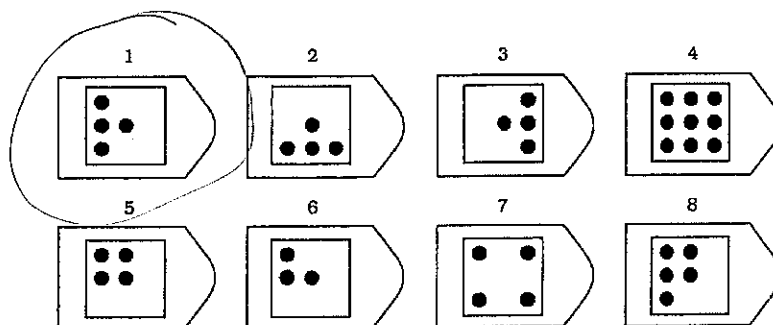
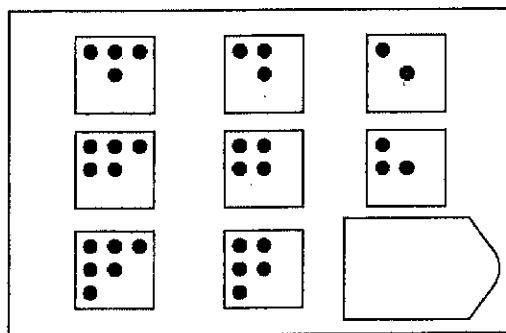
A42134271

Please choose the image that best completes each of the following patterns.

PATTERN 1

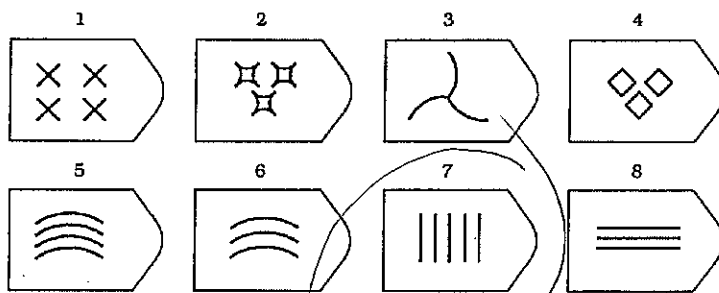
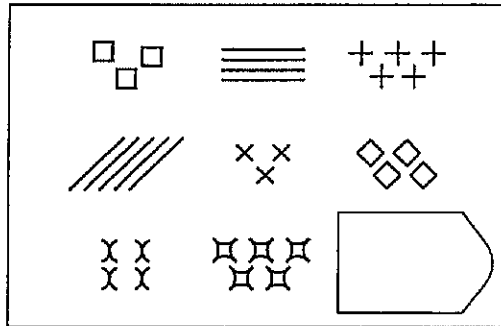


PATTERN 2

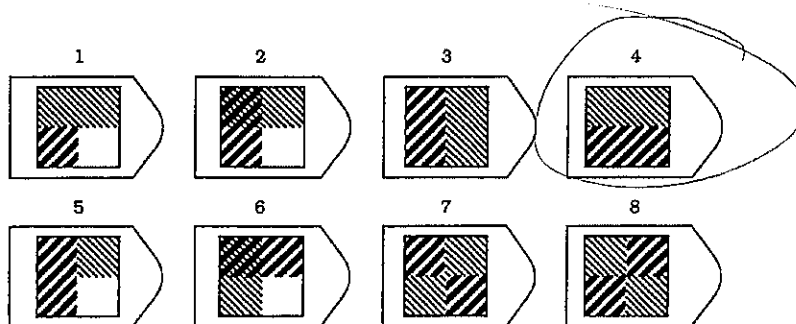
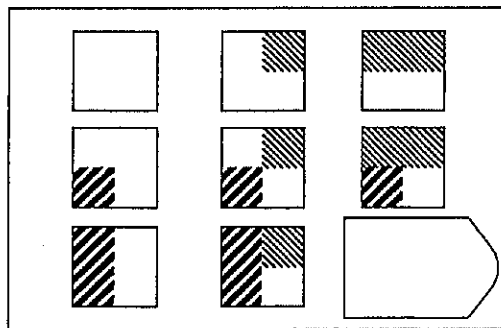


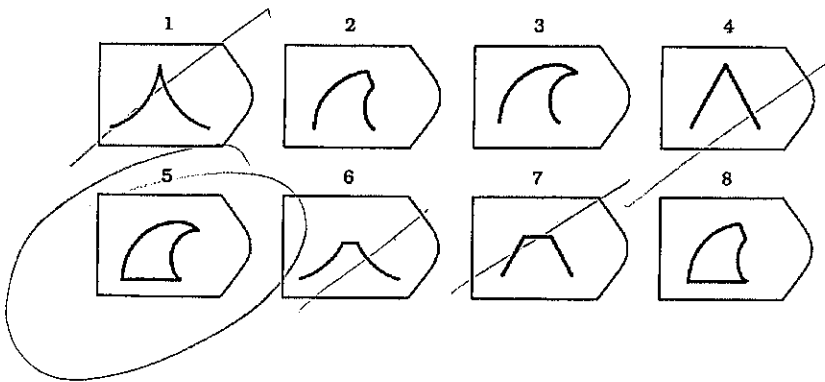
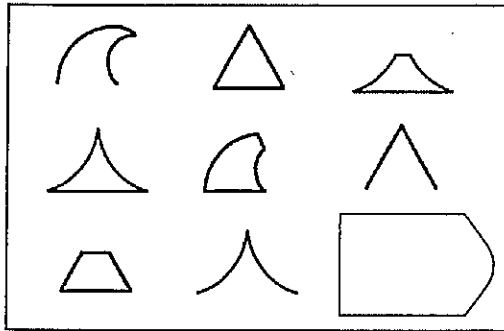
PLEASE CONTINUE ON NEXT PAGE

PATTERN 3



PATTERN 4



PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

A. While debugging their broken firewall, a programmer came across top-secret CIA files.

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C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.

D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

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A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.

C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.

D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

B. Bob was able to maximize his work time by cutting back on watching TV during the day.

C. Sean has been closely monitoring his eating in an attempt to improve his diet.

D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

C. Once he saw everyone else's formal suits, Dan went home to change clothes.

D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

A42134271

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.

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C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.

D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.

Please choose the response that is closest to an analogy that you might make.

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☒ B. Hitting your head. They both involve something that causes headaches.

C. Being sleep deprived. They both involve impaired functions.

D. Eating too much candy. They both involve lack of self-control.

E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

A. Dew forming. They are similar because they both involve a drop in temperature.

B. Blowing up a balloon. They are similar because they both involve becoming less dense.

☒ C. Clouds forming. They are similar because they both involve a phase change.

D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48444

What is your gender?

☐ Male

☒ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☐ Caucasian

☒ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

STUDENT NAME:

A36628634

GROUP:

C21

Version B

21

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- ☒ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - ☒ d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- a. A = erosion, B = deposition, C = uplift and erosion
 - b. A = erosion, B = biochemical precipitation, C = uplift and deposition
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4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- ☒ a. Human activities are the primary cause of the greenhouse effect.
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5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
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- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
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7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

carbon dioxide + water \rightarrow

+ Hydrogen

An increase in the atmospheric CO_2 affects the ocean acidification in a positive way because more CO_2 is added into the ocean. The energy caused by the sun creates molecules which is absorbed into the ocean?

These molecules rise up while the solar radiation is emitted by the sun. Whenever the atmosphere increases carbon dioxide over the ocean it allows more carbon dioxide into the ocean. The more CO_2 enters

the more CO_2 becomes a solid and forms an equilibrium. The less CO_2 you have slower they dissolve. If ash is so go into the ocean it would be negative.

Diagram

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The volcanism on Earth would increase the temperature by energy being released. Causing the molecules to rise the the temperature have increased due to surface getting hotter causing magma clumps to form which explains why the rise causing the increase to the surface. Heat push molecules up causing the cooler air to sink into the atmosphere. (The greenhouse effect is caused by radiation molecules which absorb heat because of a smaller radiation from the sun.)
This an example of Bouyancy + dense?

1

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

evaporation and degassing are similar because they both deal with releasing gas molecules; both deal with absorbing and releasing

Earn up to 1 additional point on your course grade

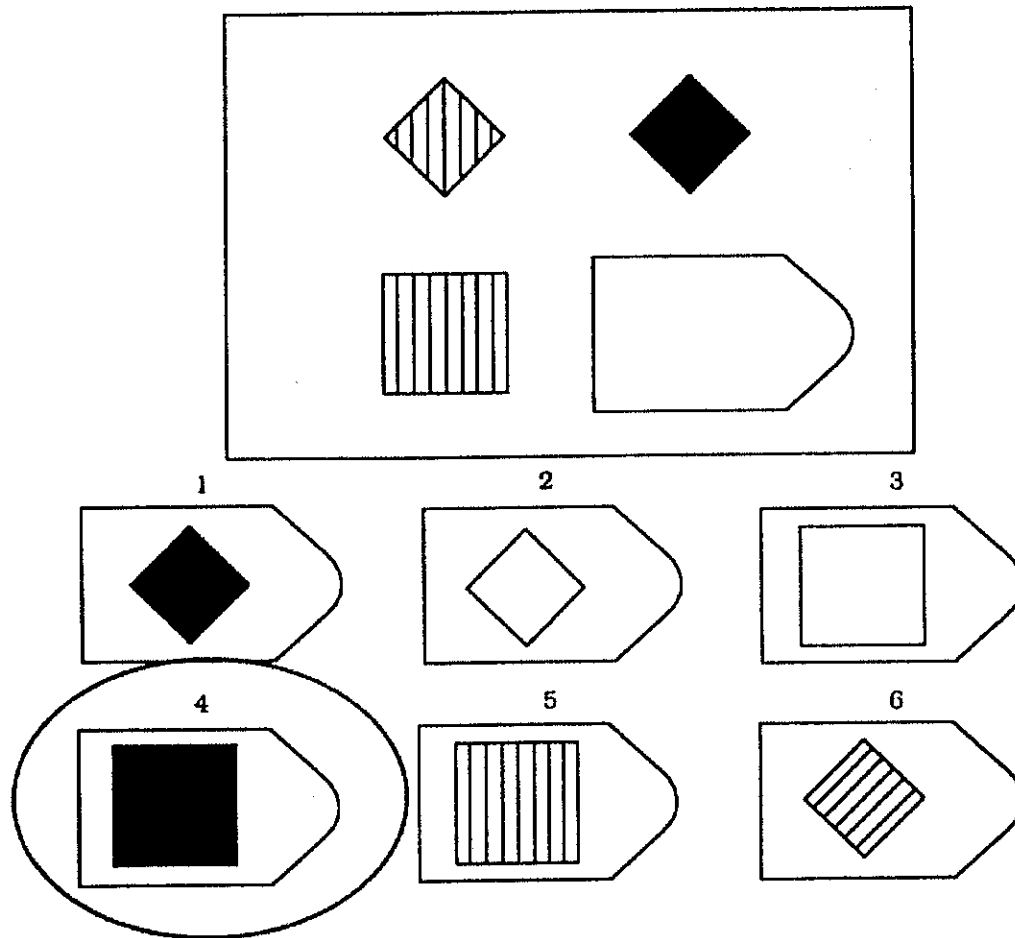
[ex. a 79% becomes an 80%]

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Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

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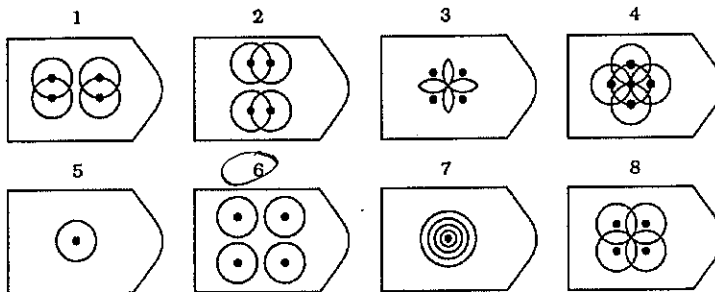
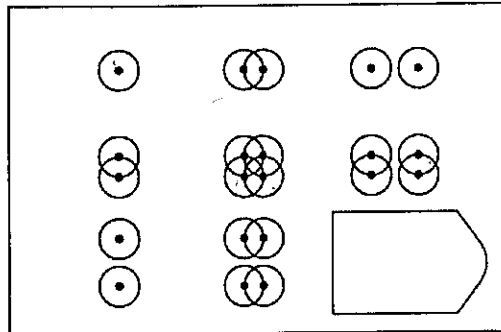


Answer: 4

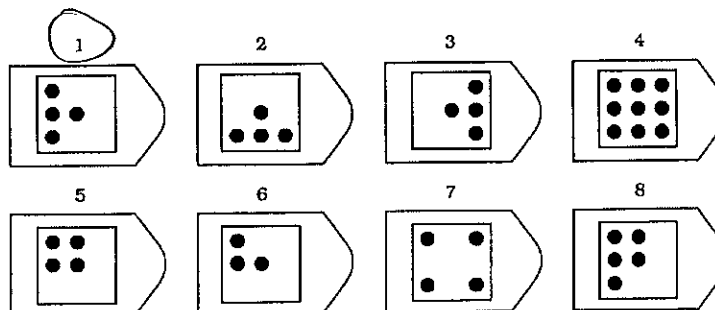
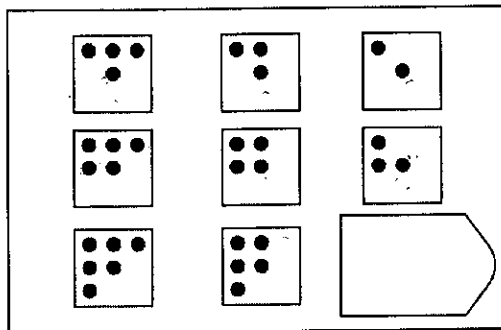
PLEASE CONTINUE ON NEXT PAGE

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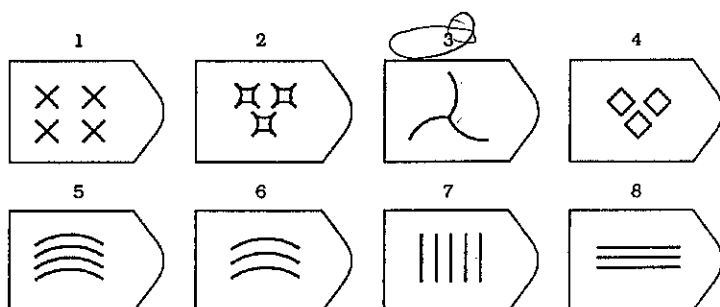
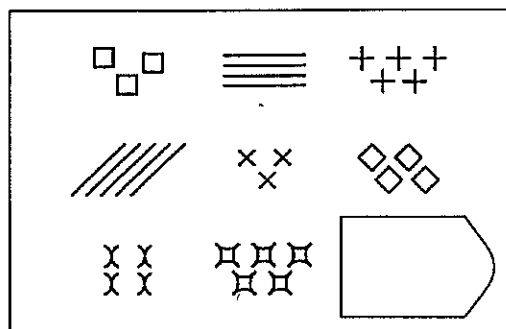


PATTERN 2

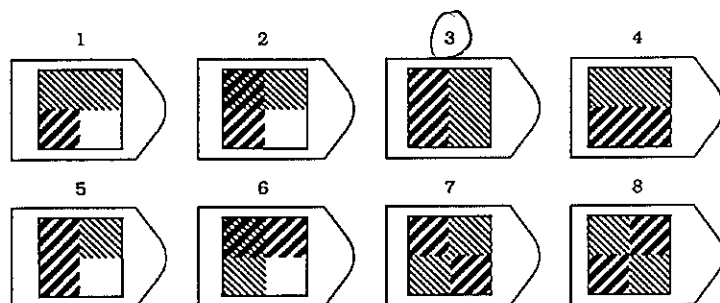
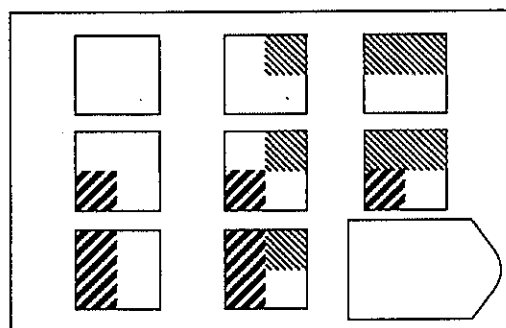


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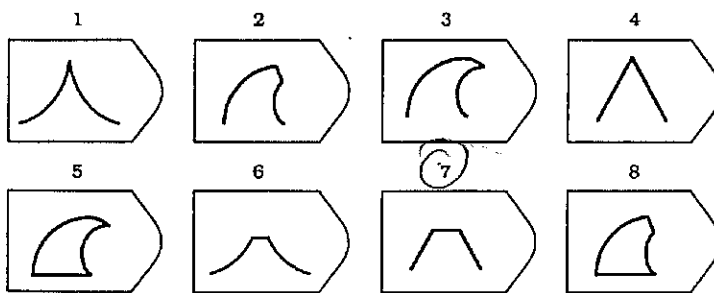
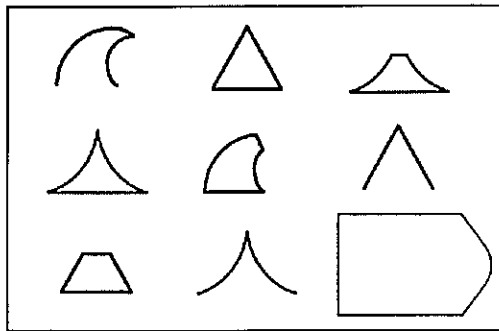
PATTERN 3



PATTERN 4



PATTERN 5



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PLEASE CONTINUE ON NEXT PAGE

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PLEASE CONTINUE ON NEXT PAGE

A36629634

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- ☐ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 24 years

What is your home zip code? 48505

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☒ African American/Black
- ☐ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A42052431
Version B

GROUP: C21

88

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
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$$\text{residence} = \frac{\text{capacity}}{\text{flow}}$$

$$\frac{10}{5} \text{ B} = 2 \quad \frac{20}{5} \text{ A} = 4$$

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- B
- ☒ a. The reservoir will eventually disappear.
 - ☐ b. The reservoir is not in equilibrium.
 - ☐ c. The reservoir is growing smaller.
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8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- D
- ☐ a. The Earth's atmosphere would become colder than it is today.
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 - ☐ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - ☐ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - ☐ d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

break bonds = use energy form bonds = release

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- B
- ☐ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - ☐ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - ☐ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

* 8. Even if we reduce greenhouse gas emissions to 1990 rates, there will be several factors involving positive & negative feedbacks that make it hard to say exactly what would happen to Earth's atmospheric temperature. But it would make sense that, over time, less greenhouse gas emissions would cause Earth's atmosphere to become gradually cooler.

(continued from bottom) and warmer. But more oceanic
CO₂ → more atmospheric CO₂ → warmer
atmosphere & oceans → less CO₂ absorbed in
oceans → less oceanic
CO₂ = negative feedback

ISP 203A: GLOBAL CHANGE

FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- A42052431 Campbell, Colleen 100p.
- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
 - Discussion of both negative and positive feedback loops to the process of ocean acidification.

25

An increase in atmospheric carbon dioxide would increase ocean acidification. CO₂ is passed freely from the atmosphere to the oceans. So if we have more CO₂ in the atmosphere it means that we will also have more CO₂ in the oceans. Cold water is more efficient at absorbing CO₂, and warm water is more efficient at releasing CO₂. With more CO₂ in the atmosphere, because of the greenhouse effect the atmosphere would become warmer, therefore making the oceans warmer. Because the oceans are warmer, less CO₂ is being absorbed into the oceans, but the CO₂ that is in the oceans is being released back into the atmosphere at a faster rate. This increased presence of CO₂ will cause the atmosphere to get even warmer, making the oceans even warmer, etc... this is a positive feedback loop because the atmosphere and oceans will become continually warmer.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature? Colder

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

23

A sudden increase of volcanism on Earth would cause large amounts of ash to be released into the atmosphere. Because of all this ash, less solar radiation will reach Earth's surface because the ash will reflect a lot of that solar radiation back in to space. With the greenhouse effect, solar radiation reaches Earth's surface where it is absorbed then re-emitted back into the atmosphere as infrared energy. The greenhouse gases in the atmosphere trap much of this infrared energy, causing the Earth to remain relatively warm, even after the sun has set. But if we have large amounts of ash in the atmosphere because of volcanic eruptions, then less solar radiation will ever reach Earth's surface because the ash will reflect much of it back in to space. With less solar radiation we will have less energy absorbed by Earth, and less infrared energy being re-emitted in to the atmosphere. More ash will make the greenhouse →

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

A42052431
Campbell, Colleen

Earn up to 1 additional point on your course grade

[ex. a 79% becomes an 80%]

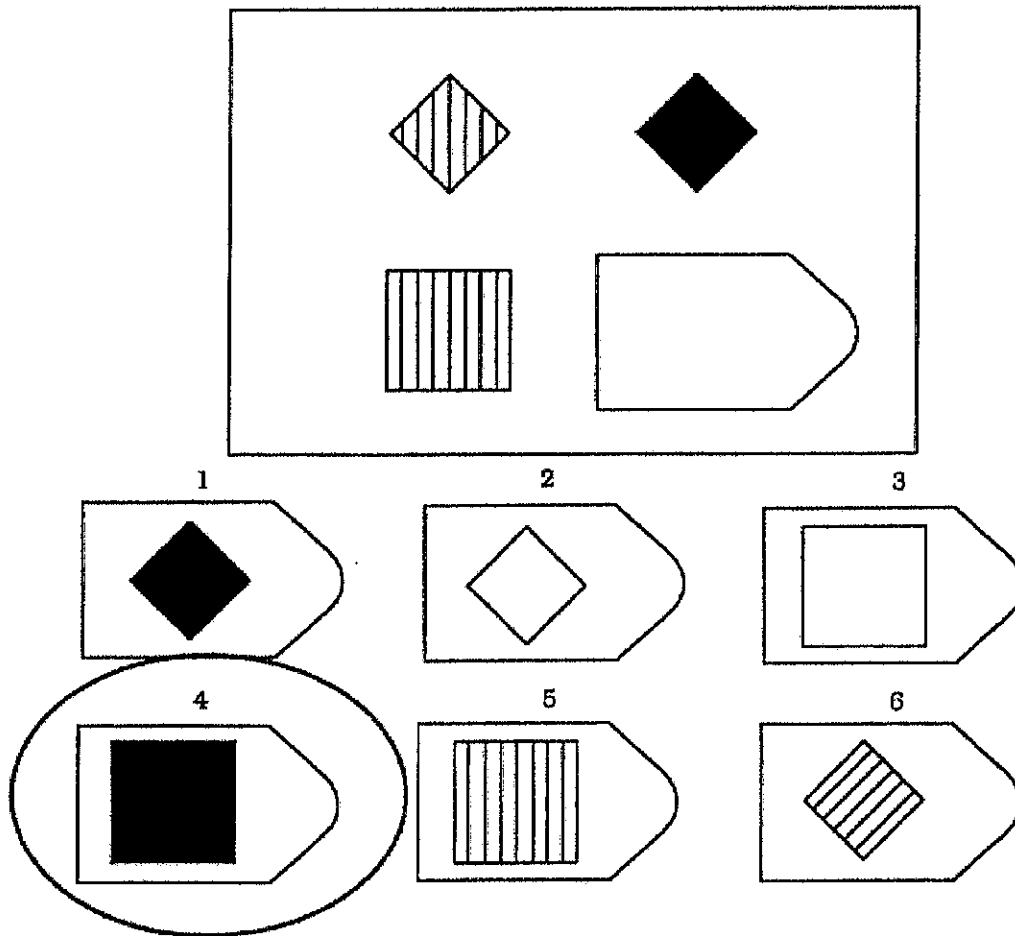
Thoughtfully complete the attached survey

Effect less strong because of lower amounts of solar radiation being able to reach Earth in the first place. Therefore, more ash in the atmosphere will cause the Earth to become cooler as the greenhouse effect is lessened.

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

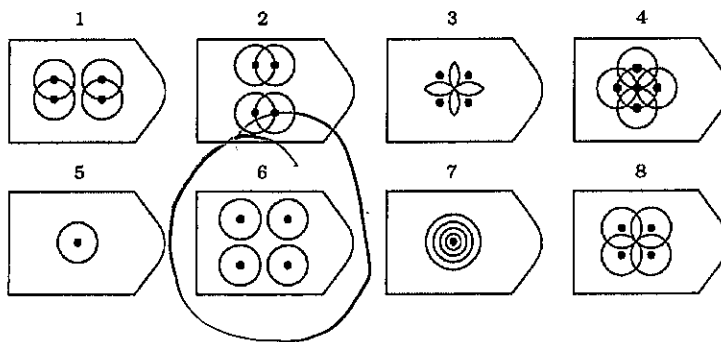
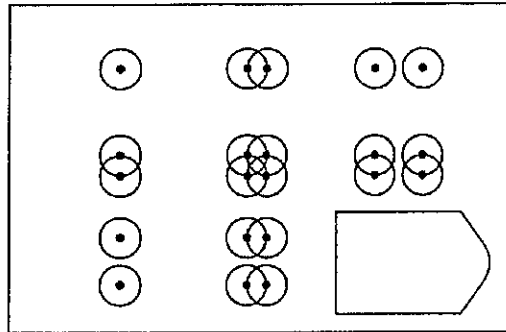
Example



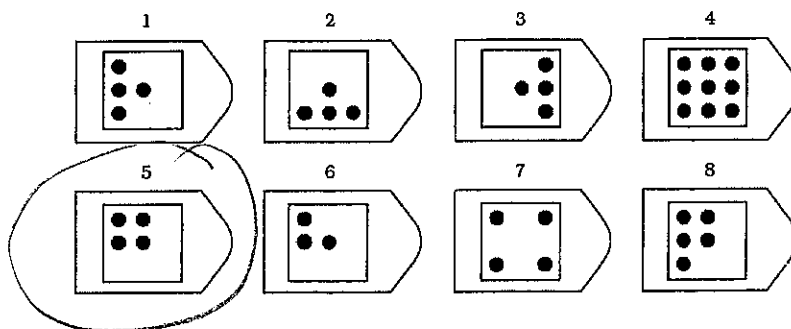
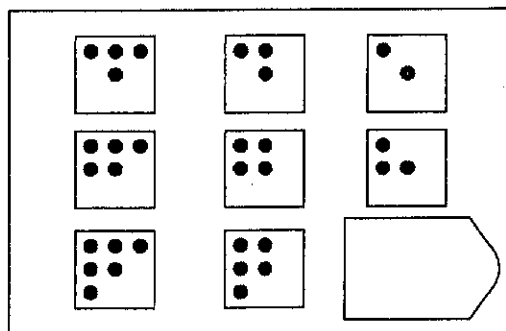
Answer: 4

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PATTERN 1



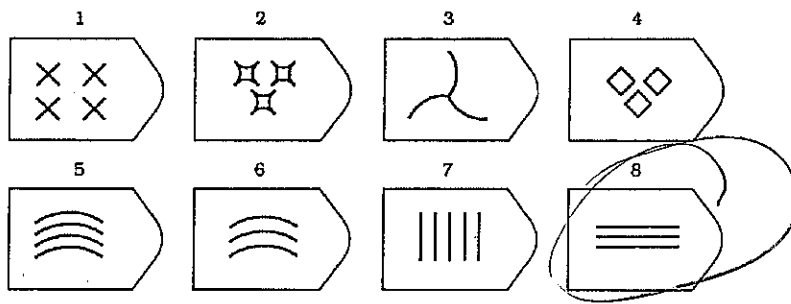
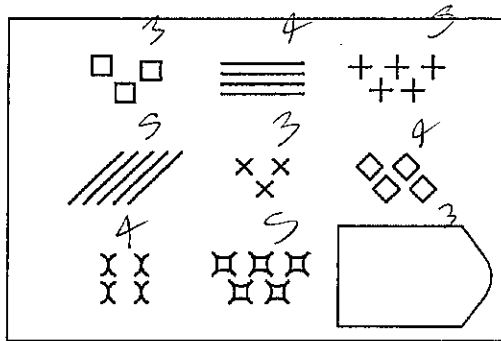
PATTERN 2



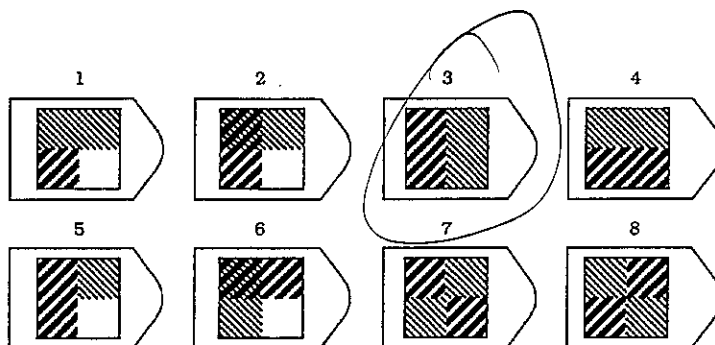
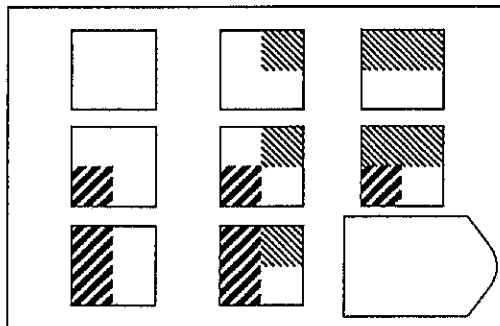
PLEASE CONTINUE ON NEXT PAGE

A42052431
 Student ID
 Campbell

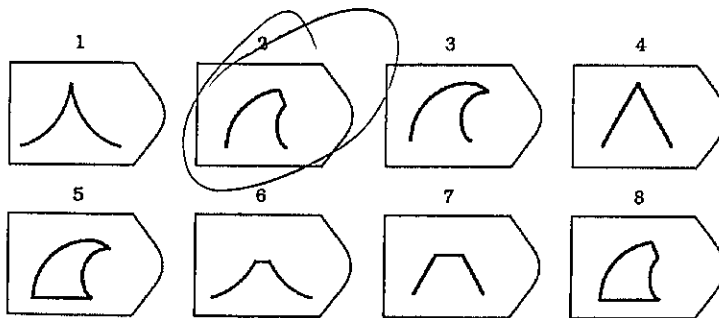
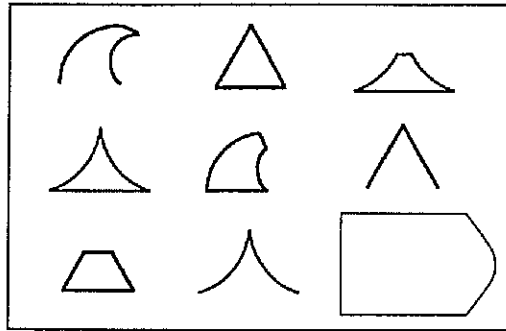
PATTERN 3



PATTERN 4



PATTERN 5



In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
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PLEASE CONTINUE ON NEXT PAGE

A42052431
Student ID
Campbell

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- A. While debugging their broken firewall, a programmer came across top-secret CIA files.
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- D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

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- B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- ☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

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- C. Once he saw everyone else's formal suits, Dan went home to change clothes.
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PLEASE CONTINUE ON NEXT PAGE

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A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.

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D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.

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B. Hitting your head. They both involve something that causes headaches.

C. Being sleep deprived. They both involve impaired functions.

D. Eating too much candy. They both involve lack of self-control.

E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

A. Dew forming. They are similar because they both involve a drop in temperature.

B. Blowing up a balloon. They are similar because they both involve becoming less dense.

☒ C. Clouds forming. They are similar because they both involve a phase change.

D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48085

What is your gender?

☐ Male

☒ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☒ African American/Black

☒ Caucasian

☐ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

STUDENT NAME: A37669797
Version B

GROUP: C21

90

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?

- D**
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere**

2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- B**
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma**
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- C**
- a. A = erosion, B = deposition, C = uplift and erosion
 - b. A = erosion, B = biochemical precipitation, C = uplift and deposition
 - c. A = dissolution, B = biochemical precipitation, C = uplift and erosion**
 - d. A = dissolution, B = deposition, C = uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- A**
- a. Human activities are the primary cause of the greenhouse effect.**
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.

5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- B**
- a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.**
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

$$RT = \frac{S}{F}$$

$$A = 2RT = \frac{2S}{F}$$

$$100 = \frac{S}{F} \quad RT = \frac{100}{F}$$
$$200 = \frac{2S}{F} \quad RT = \frac{200}{F}$$
$$RT = \frac{S}{F} \quad RT = \frac{200}{F}$$

6. Which of the following would cause the acidity of Earth's oceans to decrease?

- A**
- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.**
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

B

- a. The reservoir will eventually disappear.
- Ⓐ b. The reservoir is not in equilibrium.
- c. The reservoir is growing smaller.
- d. The reservoir's residence time is 10 years.

$$\frac{1000}{50} = 20$$

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

A

- Ⓐ a. The Earth's atmosphere would become colder than it is today.
- b. The Earth's atmosphere would become warmer than it is today.
- c. The Earth's atmosphere would remain about the same temperature as it is today.
- d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

20.5

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

A

- Ⓐ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- b. Reflection of more solar radiation, causing atmospheric temperature to increase
- c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
- d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

B

- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
- Ⓑ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

25

Ocean acidification occurs when the $\text{CO}_{2(\text{gas})}$ in the hydrosphere is hydrated ($\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{HCO}_3^- + \text{H}^+$). This reaction produces bicarbonate (HCO_3^-) ions as well as H^+ ions. The increase in H^+ ions increases acidity. ~~to where~~ CO_2 in the atmosphere is dissolved ~~in~~ oceans, the dissolved CO_2 ~~then~~ undergoes hydration. Therefore an increase in atmospheric CO_2 would increase ocean acidification because more carbon will be dissolved and converted to HCO_3^- & H^+ .

~~positive~~ negative

An example of ~~positive~~ feedback is the ~~an~~ increase in atmospheric CO_2 causing increase in global temperature (causing water temperature to increase). Warmer water holds less gas, so warmer water would take in less CO_2 and acidification will decrease. It is ~~positive~~ negative feedback because there will be ~~less~~ CO_2 in the ~~atmosphere~~ hydrosphere to be hydrated.

{at the same time increase $\text{CO}_{2(\text{gas})}$ in atmosphere will increase the dissolving and acidification process, however.} (less CO_2 to be hydrated)

if this is negative feedback to acidification because as water warms it holds less gas, this effect however wouldn't be enough to counterbalance acidification

Positive feedback for ocean acidification would be more acidification leads to more HCO_3^- & H^+ ions, and the HCO_3^- ions ~~are~~ ^{are} biochemically precipitated & this process releases CO_2 into the atmosphere, more CO_2 means more of it to be dissolved then hydrated to HCO_3^- & H^+ \rightarrow increase acidification.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

Volcanism releases CO_2 into the atmosphere, according to the greenhouse effect visible light from sun that is absorbed by the earth turns into infrared energy, the greenhouse gases (CO_2) absorb this infrared (heat) energy. They then emit it, and the energy is either absorbed or reflected again, this "traps" ~~gas~~ heat in the atmosphere. With volcanism releasing CO_2 the temperature ~~will~~ would increase, more heat would be "trapped."

However, the increase in ash clouds will prevent visible light from reaching earth's surface, causing the temperature to go down. These two processes would balance each other out so temperature change wouldn't be as significant. If the ash were to settle, then the temperature would increase because CO_2 would still be there and ~~the~~ light would reach the earth's surface.

Visible energy
temperature goes down because ~~light~~ ^{visible energy} can't reach ~~surf~~ surface and ~~be~~ turn into infrared (heat energy)

25

Extra credit (2 points).

How are evaporation and degassing similar and/or different? (from liquid in ~~water~~ oceans, etc. to

Evaporation \rightarrow ~~gas~~ ~~from~~ liquid going to atmosphere (becoming liquid in atmosphere)

ON BACK...

degass \rightarrow CO_2 (Hydrogen) \rightarrow CO_2 atmosphere

earth's surface or
the hydrosphere hydrosphere

Evaporation is when liquid goes from ~~a reservoir on~~ ~~the hydrosphere~~ (ocean, lake, etc.)
~~Earth's~~ to becoming liquid in the atmosphere.

Degassing is when CO_2 in the hydrosphere becomes CO_2
in the atmosphere.

Similar because molecules in both process move from ~~earth's surface~~
water sources to the atmosphere

Different because evaporation involves H_2O , degassing involves CO_2

Earn up to 1 additional point on your course grade

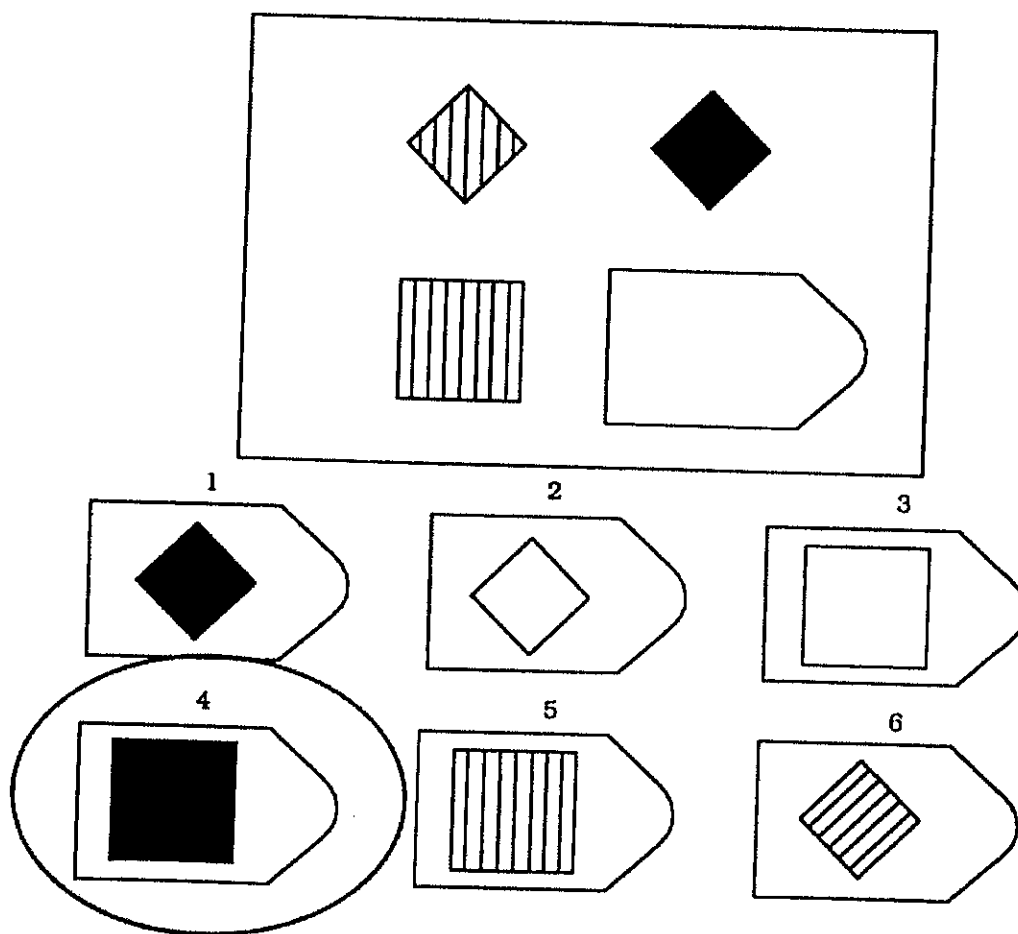
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

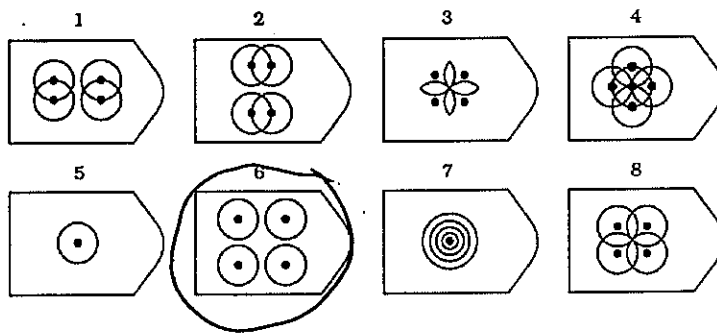
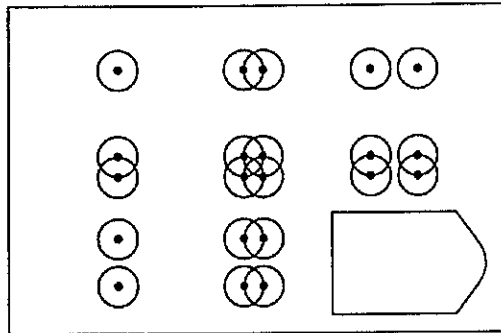


Answer: 4

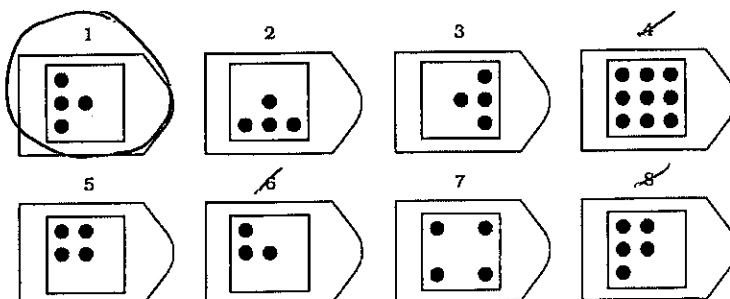
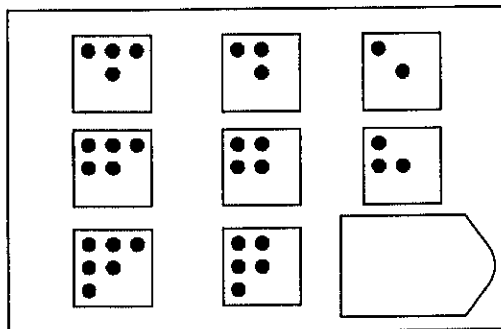
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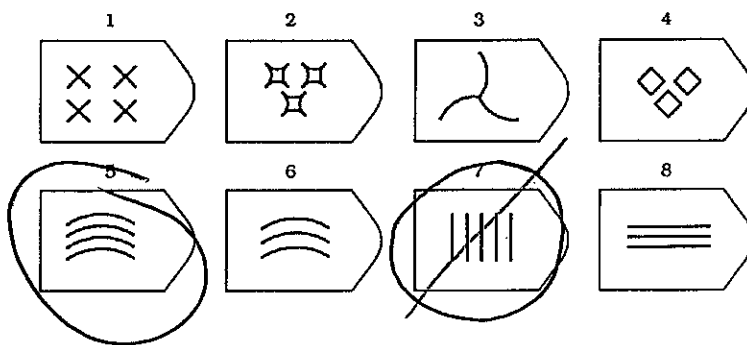
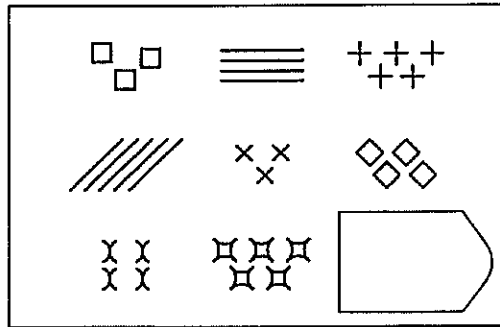
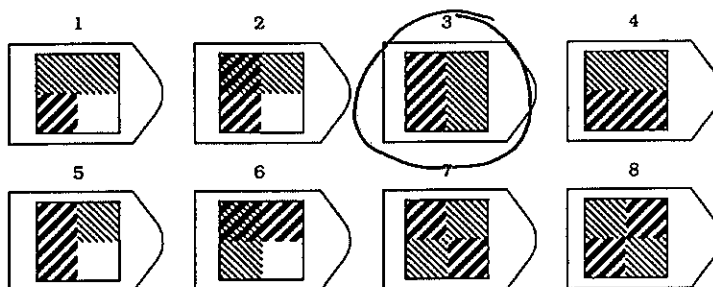
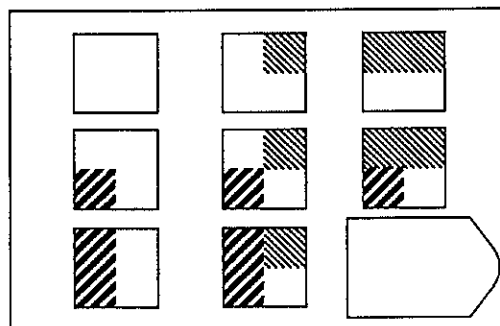
PATTERN 1

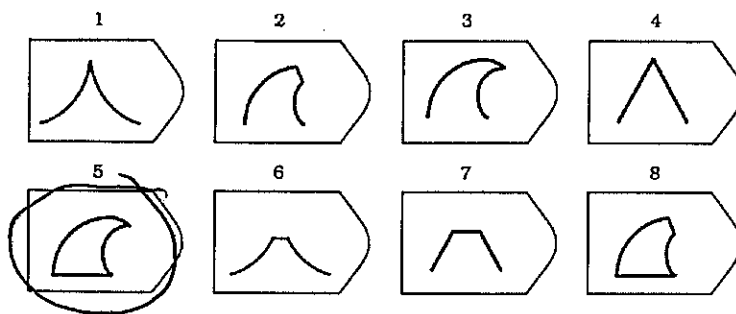
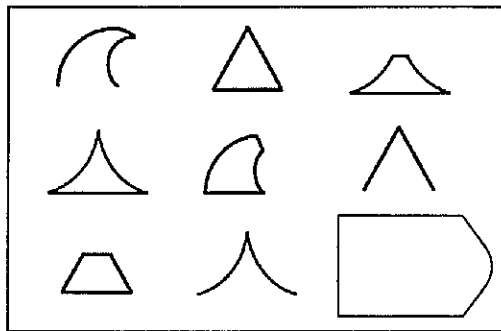


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

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PLEASE CONTINUE ON NEXT PAGE

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-

Please choose the response that is closest to an analogy that you might make.

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- A. Dew forming. They are similar because they both involve a drop in temperature.
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- C. Clouds forming. They are similar because they both involve a phase change.
- ☒ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 48363

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☐ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☒ Other

STUDENT NAME: A42829869
Version A

GROUP

C22

88

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- ☒ a. The magma becoming colder
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- ☒ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
☒ b. Melting of permafrost resulting in more methane escaping into the atmosphere
☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- ☒ a. A= erosion, B= deposition, C= uplift and erosion
☒ b. A = erosion, B= biochemical precipitation, C= uplift and deposition
☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
☒ d. A = dissolution, B= deposition, C= uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- ☒ a. Human activities are the primary cause of the greenhouse effect.
☒ b. Natural processes are the primary cause of the greenhouse effect.
☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
☒ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
☒ e. The human and natural causes of the greenhouse effect are not understood.

5. Which of the following would cause the acidity of Earth's oceans to decrease?

- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
☒ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
☒ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- ☒ a. Reservoir A has a shorter residence time than Reservoir B.
☒ b. Reservoir B has a shorter residence time than Reservoir A.
☒ c. Reservoir A and Reservoir B have equal residence times.
☒ d. More information about Reservoir A and Reservoir B is needed.

Same inflow
outflow
and are
equal

$$\frac{100}{2} \quad \frac{1000}{2}$$

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- ☒ a. The reservoir will eventually disappear.
☒ b. The reservoir is not in equilibrium.
☐ c. The reservoir is growing smaller.
☐ d. The reservoir's residence time is 10 years.



8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?


- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
☐ b. Reflection of more solar radiation, causing atmospheric temperature to increase
☐ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
☐ d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- ☒ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
☒ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
☐ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- ☒ a. The Earth's atmosphere would become colder than it is today.
☐ b. The Earth's atmosphere would become warmer than it is today.
☐ c. The Earth's atmosphere would remain about the same temperature as it is today.
☐ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

 1900
↓
decreased

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

25

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

ocean acidification is the process where carbon dioxide molecules combine with hydrogen ions ^{that} make the acidity in oceans rise. ~~ocean temperatures have the ability to absorb more CO₂~~ An increase in atmospheric CO₂ would also cause an increase in oceanic CO₂ which would therefore cause ocean acidification to rise. Because more CO₂ ions would chemically bond with the hydron (H) ions. A positive feedback associated w/ ocean acidification, for example, can be the Industrial Revolution, where more fossil fuels are being burned, increasing CO₂ levels in the atmosphere, creating more CO₂ ions which will link with hydrogen ions, to form acid rain for example and the acid rain will increase ocean acidity. This is a positive loop because it increases, speeds up ocean acidity. A negative ~~loop~~ feedback loop would slow down ocean acidification. An example could be increased ~~albedo effect because the earth becomes reflective and more heat is reflected into space. This causes temps to decrease in the atmosphere & oceans to decrease cold water~~ → Greenhouse Effect, which increases atmospheric temps & ocean temps. warmer ocean ~~tem~~ water has less ability to absorb CO₂ so ocean acidification would decrease. ← negative feedback.

(more greenhouse effect) (CO₂ in atmosphere) (greenhouse gas)

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The Greenhouse Effect is the process through which greenhouse gases trap in heat. ~~visible heat. The sun's energy from the sun hits Earth's atmosphere. Some is absorbed and some reflects back into space. The energy that is absorbed is converted to infrared. The infrared bounces off and is trapped in by the greenhouse gases. The greenhouse gas re-emit the infrared waves because they don't absorb them. Essentially, the greenhouse gases trap in heat in Earth's atmosphere. The increase in volcanism creates a cloud block which will block in the incoming energy from the sun. This will decrease temperatures. However, when clouds form, energy is being released which has a tendency to increase temperatures. Overall, I think the cloud block would block a lot of energy from the sun and temperatures would decrease.~~

18

difference:
vaporization is thermal energy.
degassing breaks chemical bonds.

(block solar radiation)

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

liquid to gas
liquid to water vapor (gas)

They both change phases, but evaporation is liquid to gas. They both change phases but are the opposite effect.

Earn up to 1 additional point on your course grade

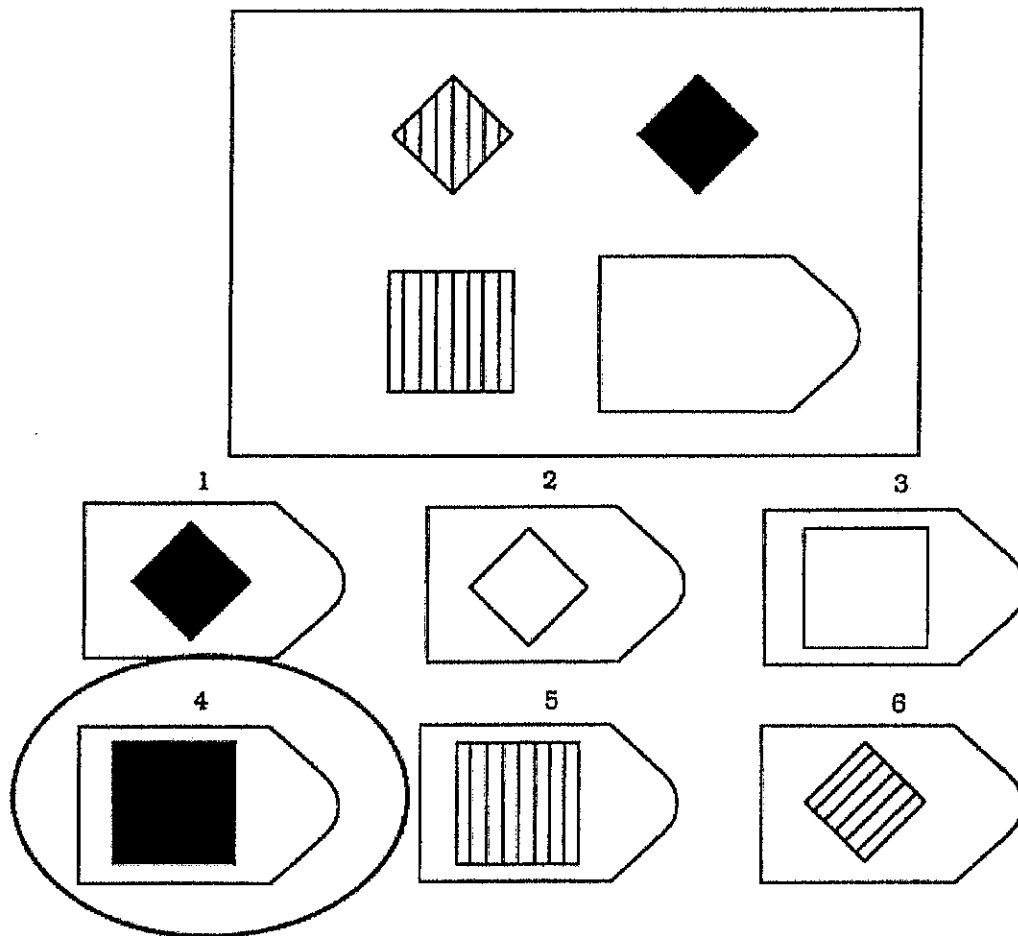
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example



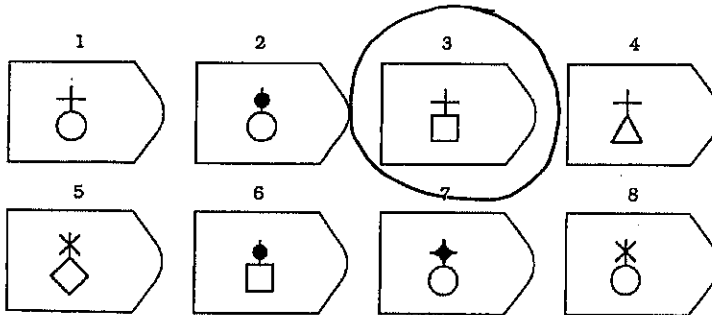
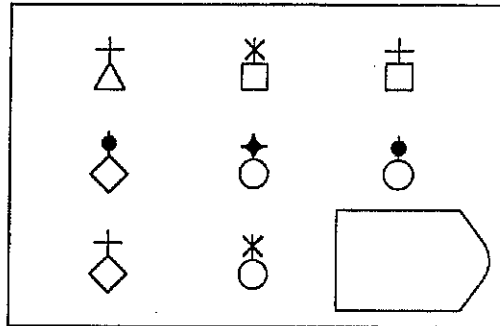
Answer: 4

PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

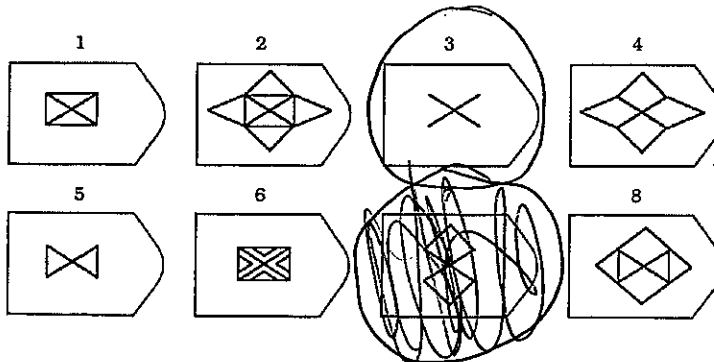
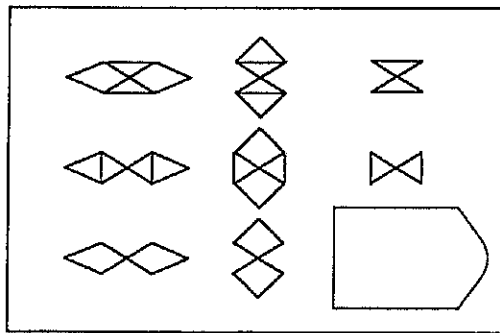
PATTERN 1

3



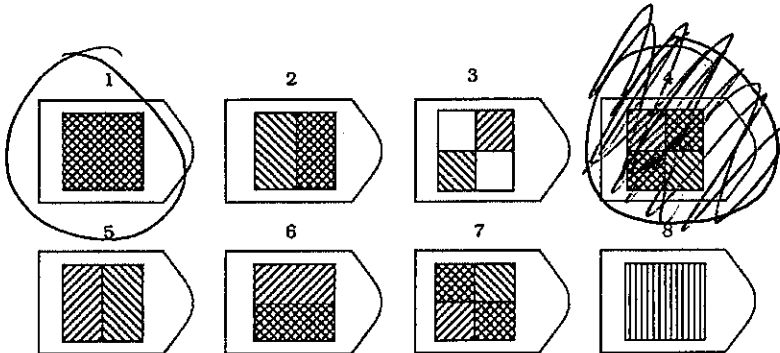
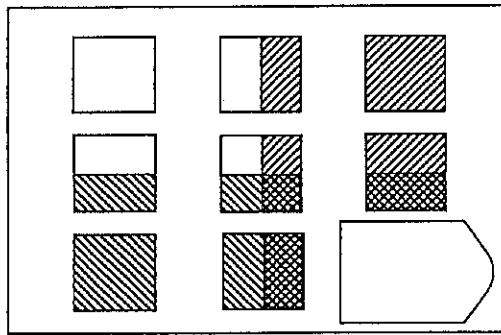
PATTERN 2

3

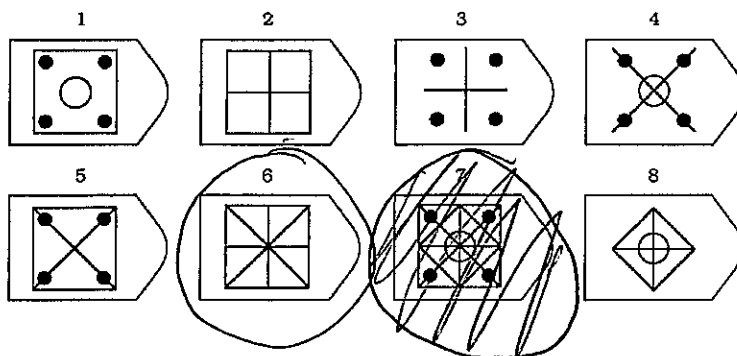
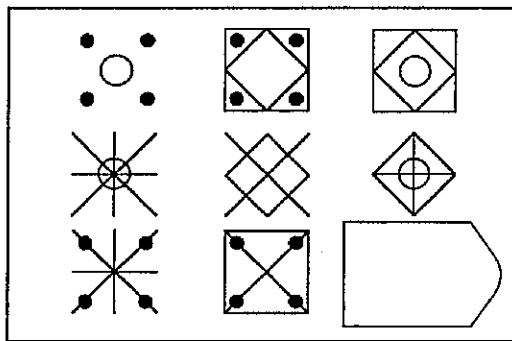


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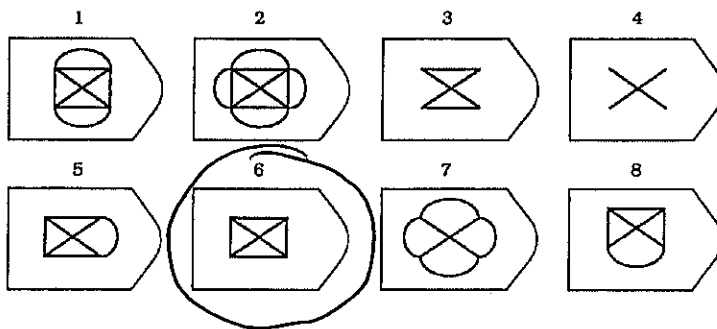
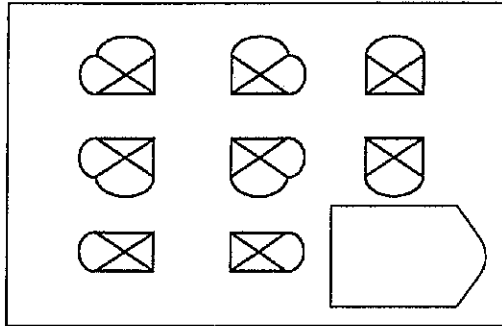
PATTERN 3



PATTERN 4



PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
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PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

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C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.

D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

A. Before the annual parade, the city council decided to renovate one of the buildings downtown.

B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.

C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.

D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

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A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.

B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.

C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.

D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

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A. The toddler wrote on the walls with pens when the babysitter wasn't looking.

B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.

C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.

D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- B. A leaf in the air. They are similar because they both move through the air carried by the wind.
- ☒ C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- ☒ A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48026

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☒ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A42839439
Version A

GROUP: C22

78

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- B
- a. The magma becoming colder
 - ☒ b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
2. Which of the following would be considered a negative feedback to increasing global temperature?
- C
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- C
- a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- B
- a. Human activities are the primary cause of the greenhouse effect.
 - ☒ b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
5. Which of the following would cause the acidity of Earth's oceans to decrease?
- 1
- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- A
- ☒ a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

- B
7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
- B
8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ☒ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- A
9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ☒ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
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 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
- A
10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide would affect the ocean acidification by becoming more acidic. Since there is more CO_2 in the atmosphere the more CO_2 will settle in the ocean. When the carbon dioxide settles with H_2O it dissolves and forms HCO_3^- . With this happening, it will create effects like a decline in the fish population & decline of coral reef. The more CO_2 in the ocean the colder the ocean gets, making the influx of CO_2 increase, causing the pH levels of the ocean to rise as well. So while more gases in the atmosphere the higher the pH level of the ocean. Positive feedback would be while the residence time in one is increased, so will the other residence time in other reservoir causing the system to all change together to reach equilibrium. Negative feedback would be the change in temperature?

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

23

The greenhouse effect is the process in which the Earth receives heat that is emitted by the sun's solar energy. The sun gives off visible ~~heat~~ wave lengths that are hard to be absorbed by molecules, & by greenhouse gases. So the ~~wave~~ lengths pass through the atmosphere into the Earth's surface where it is then either absorbed or reflected. When the heat is reflected, the heat doesn't affect the temperature of the atmosphere, it simply goes into space. If the heat is then absorbed, the heat gets excited & then re-emits in all different directions. Then, it can either be reflected into space, or be reabsorbed, being known as trapped in the greenhouse effect. When volcanism occurs, it then gives off large ash clouds that float in the atmosphere. With these clouds they are placed where the visible wave lengths proceed, & then end blocking the pathway, with the ash clouds there, it prevents heat to the Earth & then is reflected back into space like in the greenhouse effect, when the wave lengths are reflected the heat can be absorbed causing the temperature to decrease, but an increase in CO₂ tend to rise. Over time til the ashes settle at the temperature will be low.

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is the transformation from liquid to gas while degassing is changing the gas formed into a solid or liquid.

through gravitational + thermal energy

Earn up to 1 additional point on your course grade

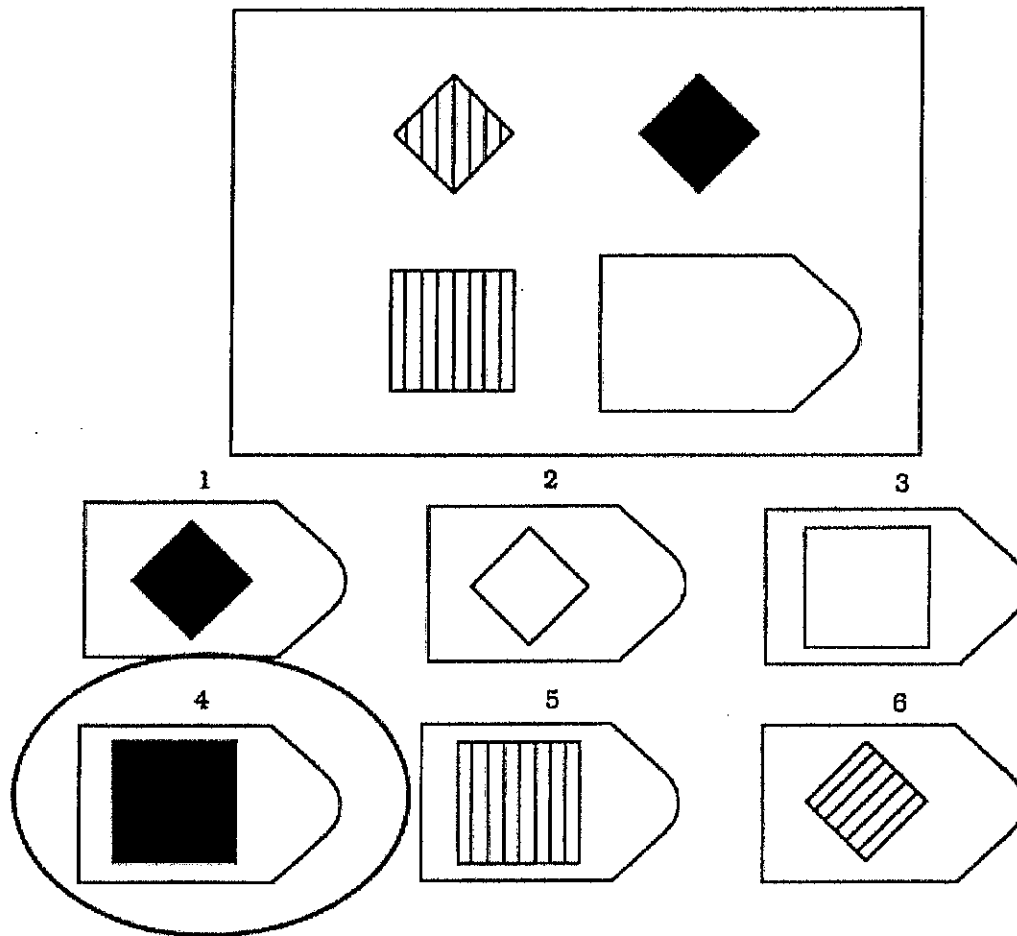
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

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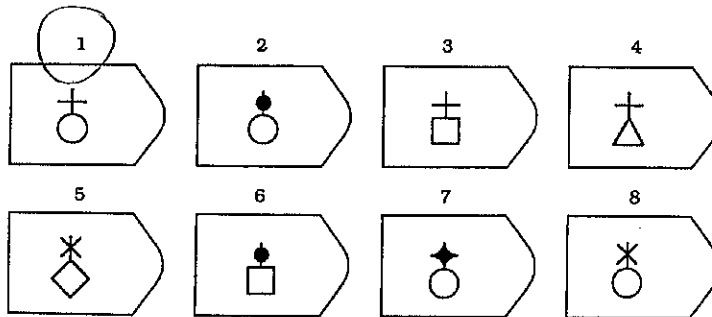
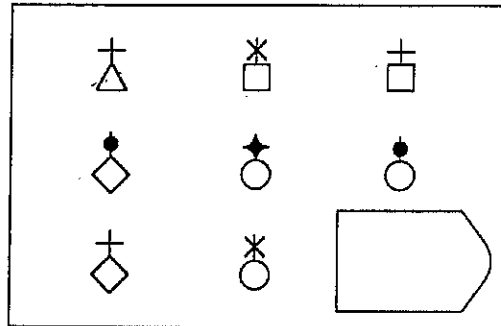


Answer: 4

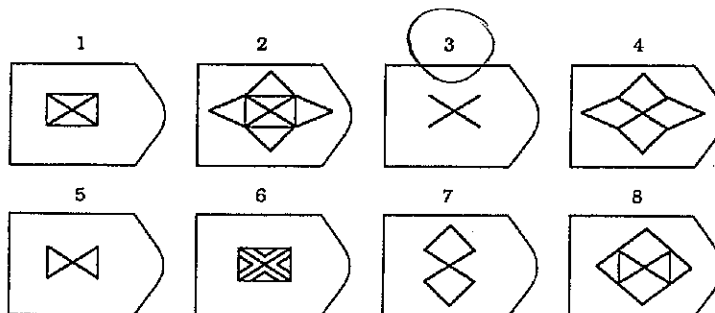
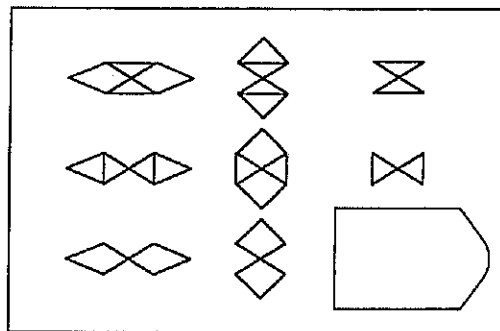
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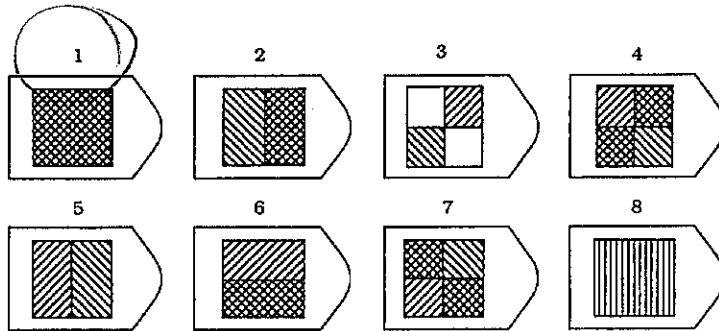
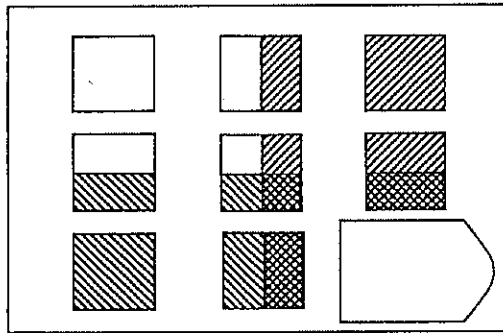
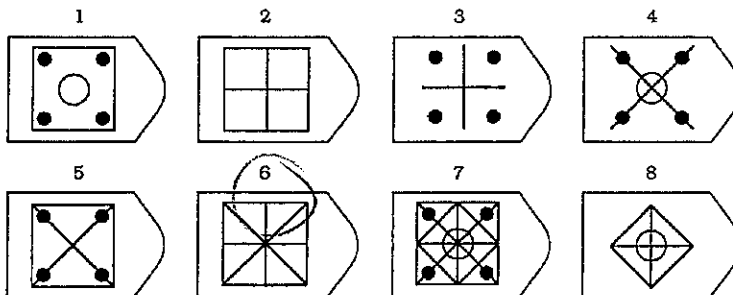
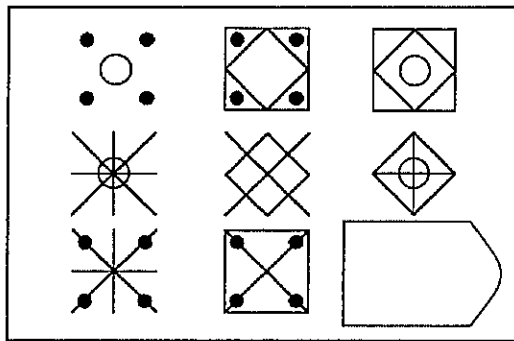
PATTERN 1



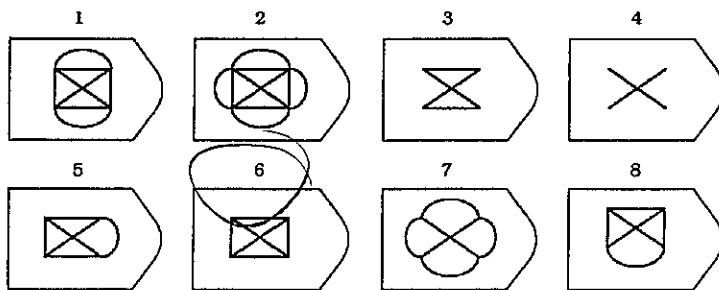
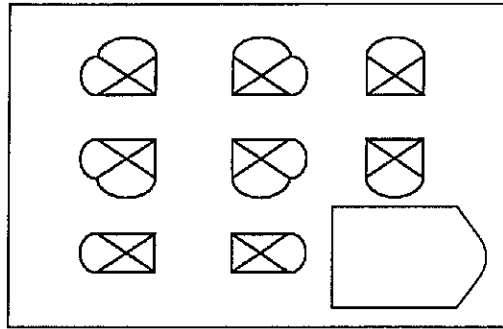
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

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Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

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PLEASE CONTINUE ON NEXT PAGE

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 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...
- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
 - B. A leaf in the air. They are similar because they both move through the air carried by the wind.
 - C. Blowing bubbles. They are similar because they both float until they eventually pop.
 - D. A cloud in the sky. They are similar because they both float and are carried by the wind.
2. Catching a cold is like...
- A. Getting the flu. They are similar because they are both caused by viruses.
 - B. Getting pink eye. They are similar because they are both contagious.
 - ☒ C. Getting the flu. They are similar because they are both caused by not washing your hands.
 - D. Forgetting to do your homework. They are similar because they are both preventable.
 - E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 18 years

What is your home zip code? 48329

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☐ Caucasian
☐ Latino/Hispanic
☒ Native Hawaiian/Pacific Islander
☐ Native American
☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A41729348
Version B

GROUP: C22

45

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - ☒ b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- ☒ a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - ☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
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- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
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7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- a. The reservoir will eventually disappear.
- b. The reservoir is not in equilibrium.
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8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- a. The Earth's atmosphere would become colder than it is today.
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- d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- b. Reflection of more solar radiation, causing atmospheric temperature to increase
- c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
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10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide would affect ocean acidification by adding more CO_2 ions into the ocean and then combining with Hydrogen ions? which makes the acidity of the ocean higher. With more CO_2 in the atmosphere this causes it to precipitate ~~down~~ to earth, and that's how it would get into the oceans. This would be considered a positive feedback loop, because if the CO_2 increases in the oceans causes more acidity, that water would evaporate and condense into clouds with CO_2 ions in them. Causing more CO_2 to precipitate back down and start the process all over. ~~ack~~

With more CO_2 in the atmosphere the global atmospheric temperature would increase. This will cause an increase in ocean temperature. Cold water is a better absorber of gases than warm water. So the ocean would absorb less CO_2 , so then in return the ocean pH would decrease. **some**

~~15~~ 15

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

ack The greenhouse effect is the process in which the earth's atmosphere become heated by energy coming from the sun. The sun sends visible energy which passes through the atmosphere and either reflects off of earth's surface or is absorbed. Its reflected back as UV rays ^{IR} and then gets trapped in the atmosphere and continues to bounce back and forth in our atmosphere. ^{= explain}

When volcanism add ash to the atmosphere the amount of visible solar energy reaching earth's surface would have decreased. The increase in volcanism would cause more ash blocking the passage of solar energy into the atmosphere. This will cause the cooling of the atmospheric temperature. This will cause a global cooling which is considered a negative feedback.

~~25~~

Spring

15

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

X Evaporation is the gassing of water molecules, and degassing is when gas bubbles in magma disappears, slowing its rise to surface.

Earn up to 1 additional point on your course grade

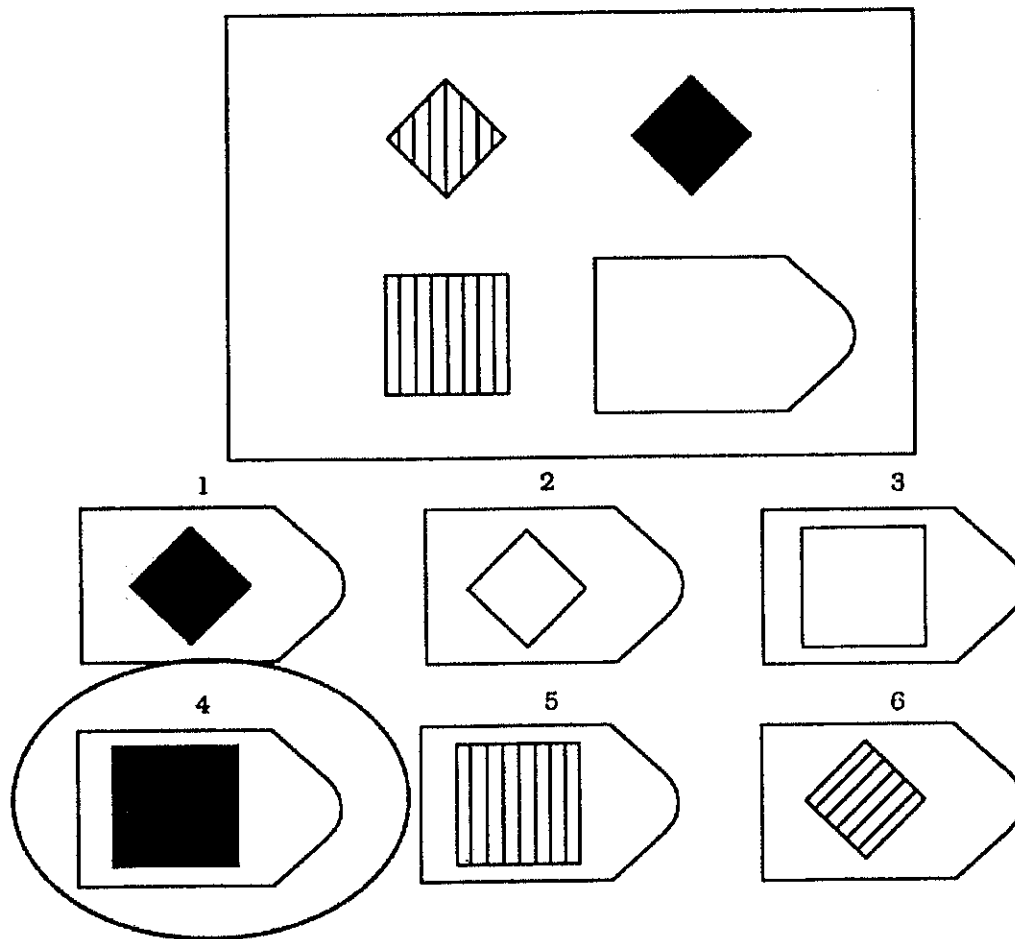
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Analogical Assessment

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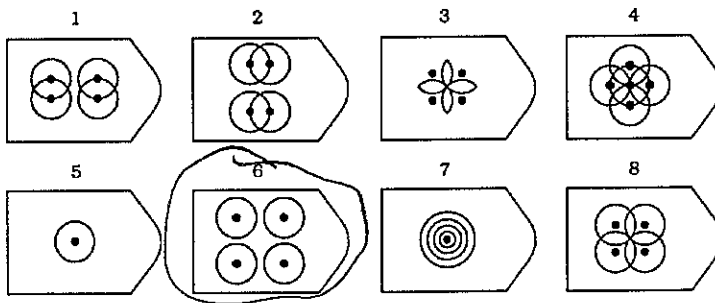
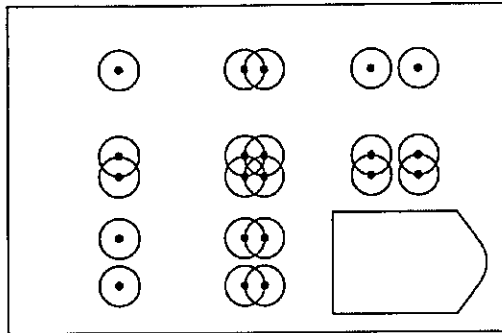


Answer: 4

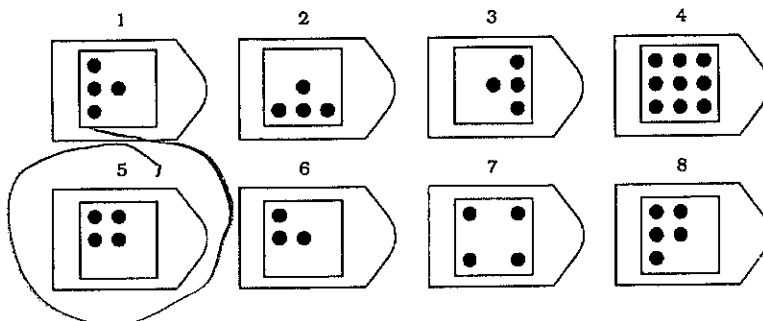
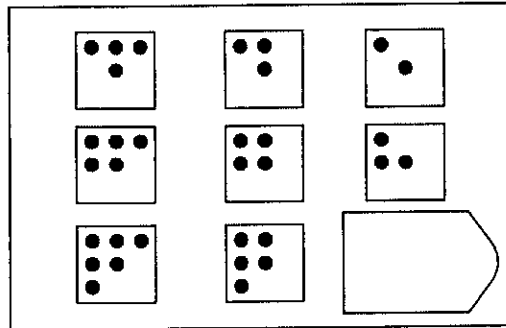
PLEASE CONTINUE ON NEXT PAGE

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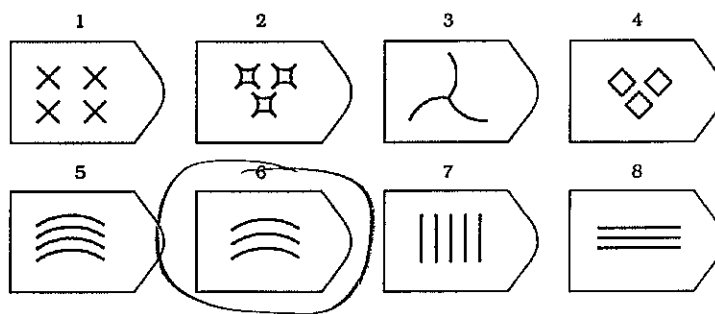
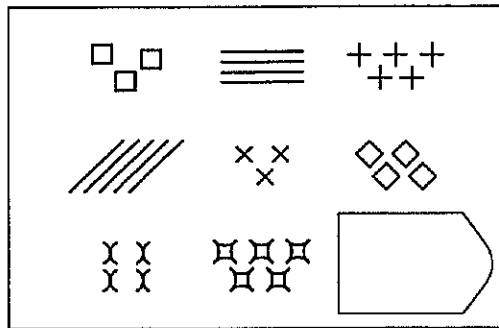
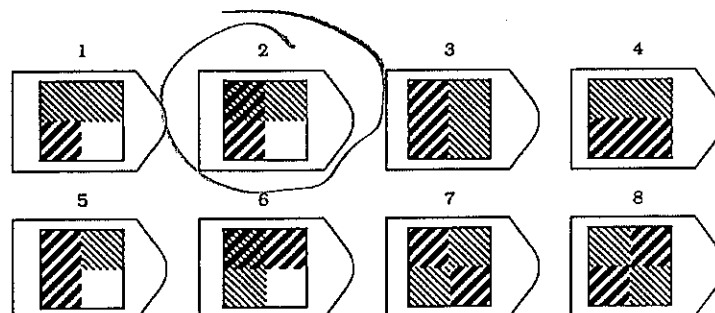
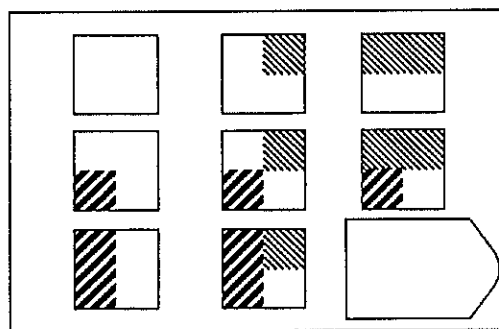
PATTERN 1



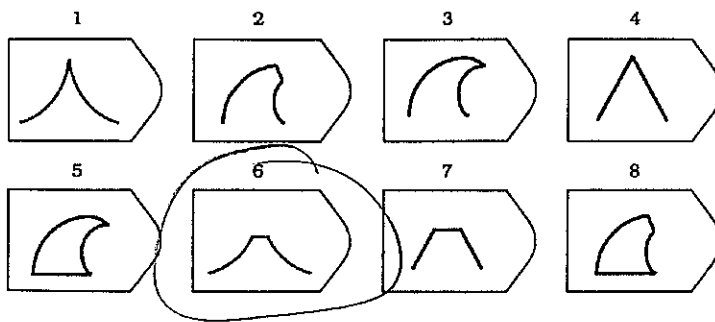
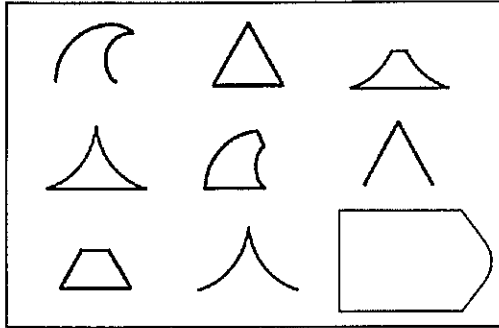
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

A. While debugging their broken firewall, a programmer came across top-secret CIA files.

B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.

C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.

D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.

C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.

D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

B. Bob was able to maximize his work time by cutting back on watching TV during the day.

C. Sean has been closely monitoring his eating in an attempt to improve his diet.

D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

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D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.

B B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.

C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.

D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

A A. Getting high. They are both involve too much of a chemical influencing the body.

B. Hitting your head. They both involve something that causes headaches.

C. Being sleep deprived. They both involve impaired functions.

D. Eating too much candy. They both involve lack of self-control.

E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

A. Dew forming. They are similar because they both involve a drop in temperature.

B. Blowing up a balloon. They are similar because they both involve becoming less dense.

C C. Clouds forming. They are similar because they both involve a phase change.

D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 60181

What is your gender?

☒ Male

☐ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☒ African American/Black

☐ Caucasian

☐ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

STUDENT NAME: A43050270
Version B

GROUP: C23

87

MULTIPLE-CHOICE. 5 points each (50 points total).

- D 1. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed.
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere.
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
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- a. The magma becoming colder
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- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

25

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

If there are more carbon dioxide in atmosphere, according to the equation, $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$, more CO_2 will dissolution in the ocean. This process will cause the acidity of the ocean's to increase.

But on the other hand, an increase in atmospheric CO_2 will cause the temperature go up. This is due to greenhouse effect. According to the principle 5, increase the temperature will cause molecules move faster, so there will be more molecules of carbon dioxide come out of ocean. This process will decrease the acidity of the ocean. But the first process will affect more on ocean acidification. For the first process, increase temperature cause the increase of acidity, so it is positive feedback. The second process, increase temperature cause the acidity of ocean's to decrease, this is negative feedback.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
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22

If the volcanism cause that erupt large ash clouds, it will cause less solar radiation come to the surface, so this will cause the decrease of earth's temperature. But because of less solar radiation come to the earth, there will be less photosynthesis happen. So this will lead to more CO_2 which is greenhouse gas be in the atmosphere. According to the greenhouse effect, it is a process of thermal energy that the radiation from other planetary surface to absorb by earth atmosphere's greenhouse gases such as CO_2 , H_2O vapor, CH_4 . So if there are more these kind of gases in atmosphere, the thermal energy radiation will be absorb more. This process will cause the increase of atmospheric temperature. So, if volcanism on Earth suddenly increase dramatically, particularly volcanoes that erupt large ash clouds, it will cause the increase in atmospheric temperature.

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Earn up to 1 additional point on your course grade

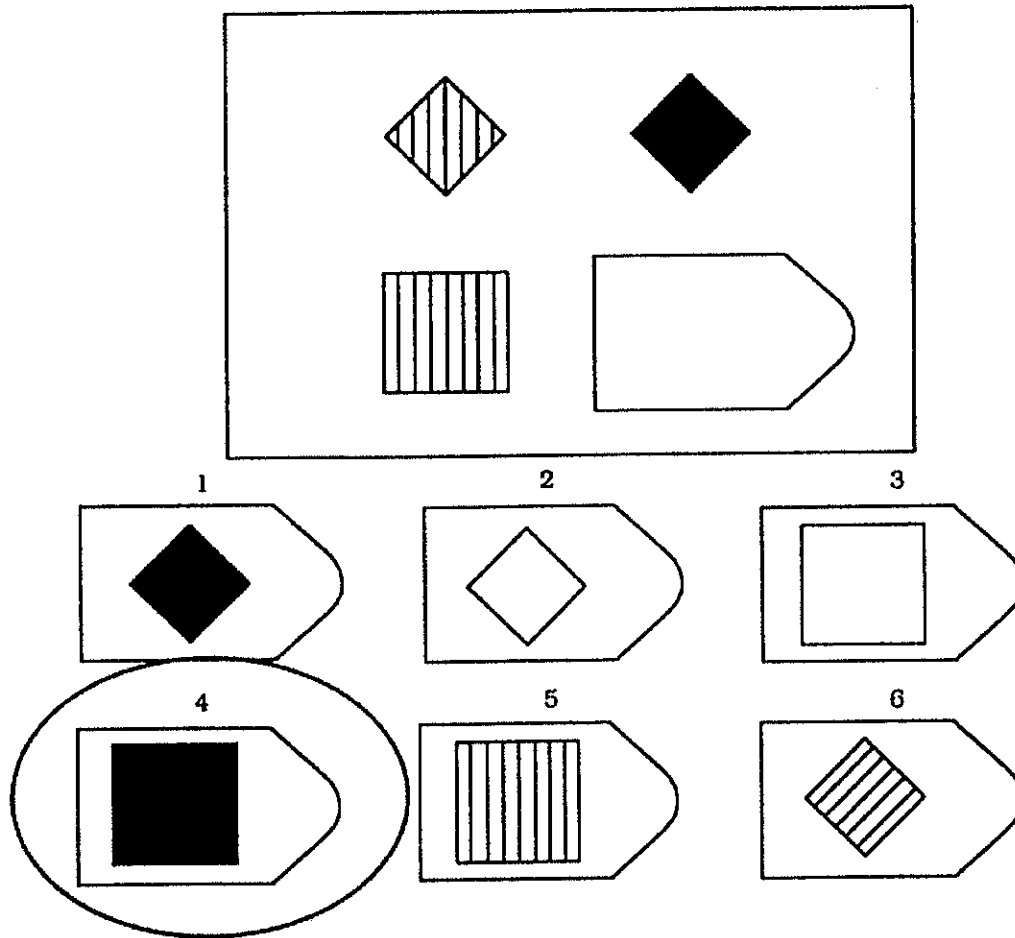
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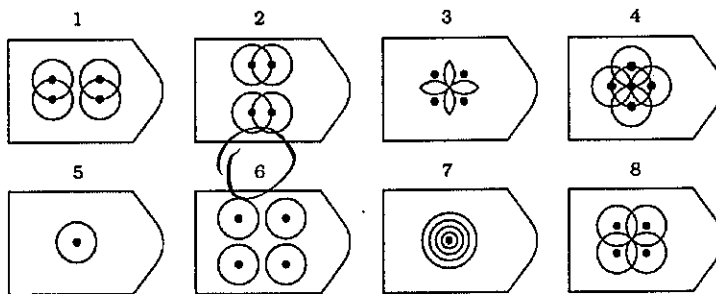
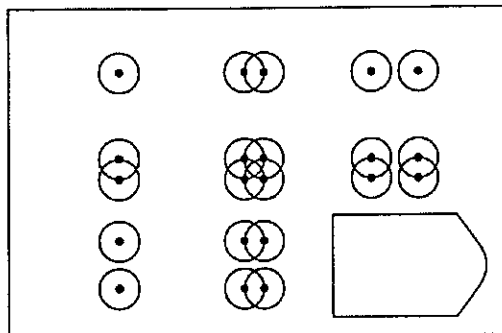


Answer: 4

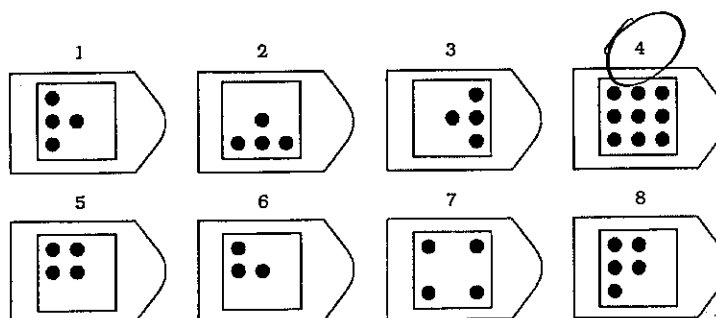
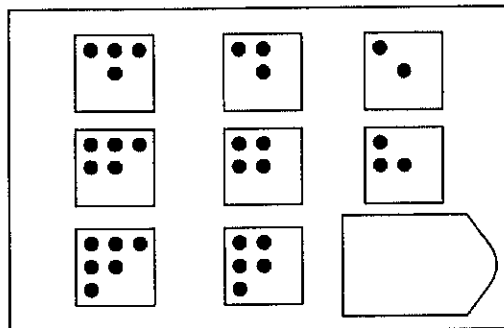
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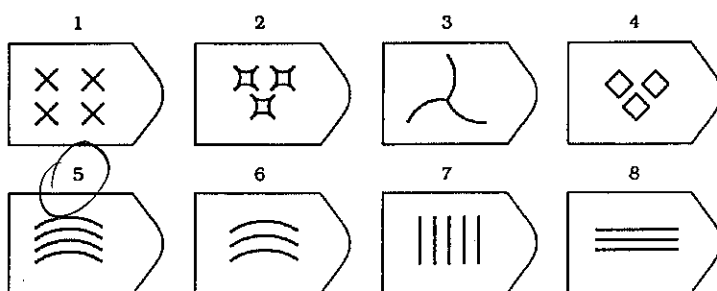
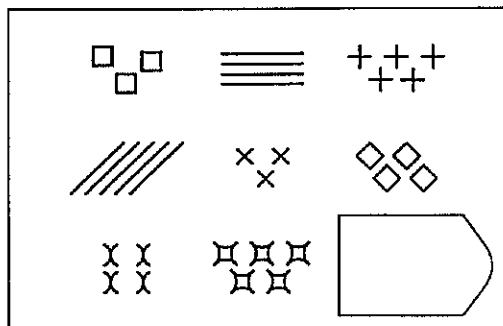
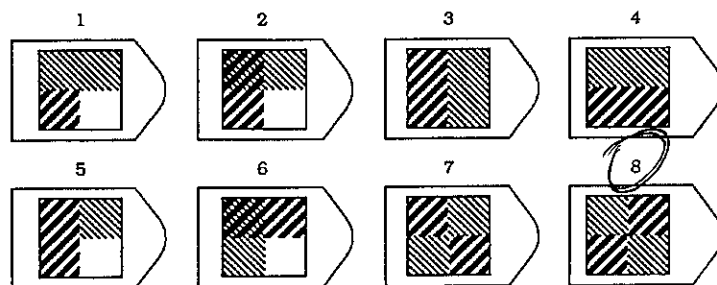
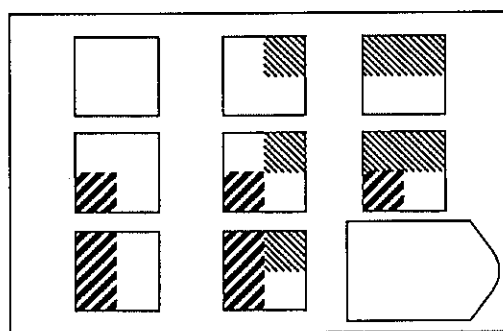
PATTERN 1



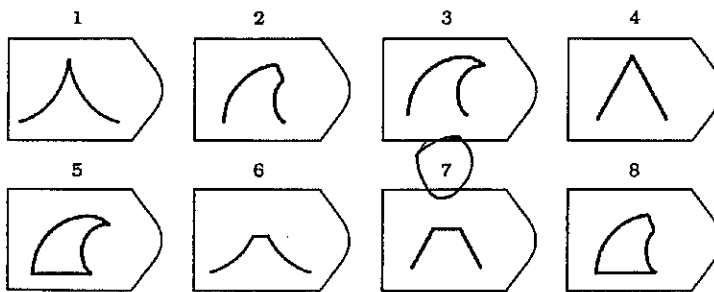
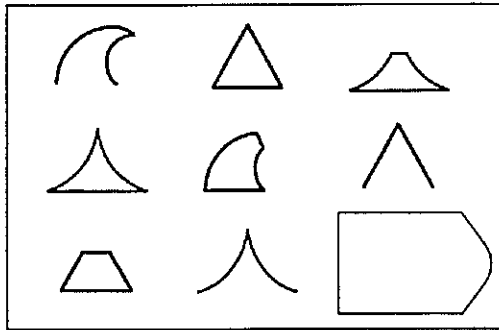
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5



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C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.

D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

A. Getting high. They are both involve too much of a chemical influencing the body.

☒ B. Hitting your head. They both involve something that causes headaches.

C. Being sleep deprived. They both involve impaired functions.

D. Eating too much candy. They both involve lack of self-control.

E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

A. Dew forming. They are similar because they both involve a drop in temperature.

B. Blowing up a balloon. They are similar because they both involve becoming less dense.

☒ C. Clouds forming. They are similar because they both involve a phase change.

D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48825

What is your gender?

☒ Male

☐ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☐ Caucasian

☐ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☒ Other Asian

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A39474585
Version B

GROUP _____

C23

87

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
 - a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere

- ☒ 2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
 - ☒ a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A . Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C .
 - a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition

- ☒ 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
 - ☒ a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.

5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
 - a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

6. Which of the following would cause the acidity of Earth's oceans to decrease?
 - ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- ☐ a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - ☐ c. The reservoir is growing smaller.
 - ☐ d. The reservoir's residence time is 10 years.
8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☐ a. The Earth's atmosphere would become colder than it is today.
 - ☐ b. The Earth's atmosphere would become warmer than it is today.
 - ☐ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - ☒ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ☐ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - ☐ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
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10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ☐ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
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SHORT ANSWER. 25 points each (50 points total)

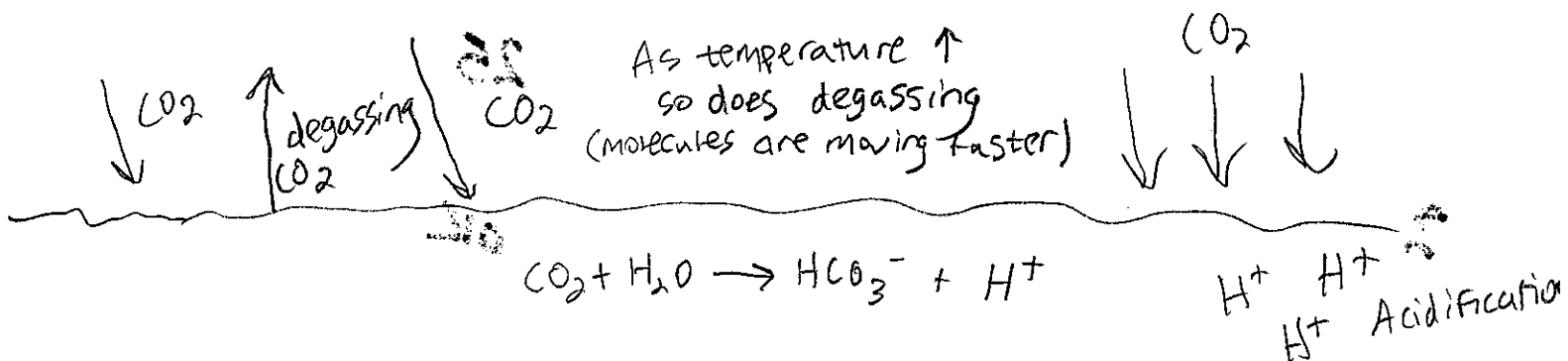
1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

25

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

a. Ocean acidification is the process in which CO_2 reacts with water to form bicarbonate and hydrogen ions. It is the hydrogen ions which lowers the pH of the oceans and makes them more acidic. An increase in atmospheric CO_2 will also increase oceanic CO_2 through dissolution because the two systems are trying to stay in equilibrium. Because of this increase in CO_2 in the oceans, there will be more hydrogen ions released and the oceans will become more acidic. This is an example of a positive feedback loop. Also, the increase in CO_2 in the atmosphere will increase atmospheric temperatures, which will increase ocean temperatures as well. Cold water holds gases more tightly than warm water, so the increased ocean temperatures will result in more degassing and less acidification. Overall, increased atmospheric CO_2 concentration will increase ocean acidification, but not at a proportional rate because of degassing resulting from higher ocean temperatures. (negative feedback loop).



2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

Volcanism is a process that can release large amounts of ash that can remain in the atmosphere for long periods of time. Volcanos also release greenhouse gases such as CO_2 . The greenhouse effect is where visible light from the sun enters through the atmosphere and is either absorbed by the earth's surface or oceans, or reflected back (albedo effect) depending on the surface. Ice for example reflects most of this light back. Light in this form reflected back does not heat the earth. It has to be absorbed and transformed into infrared energy. When this light is reflected back, it can be absorbed easily by greenhouse gasses. These gasses then emit the infrared energy back to the earth where it can be re-absorbed or reflected back again. This cycle continues and results in global warming. Large ash clouds in the atmosphere would decrease the amount of visible light that makes it to the surface. This would also decrease the amount of infrared light that can be absorbed by greenhouse gasses. This would cause the atmospheric temperature to decrease as well. This is an example of a positive feedback loop.

25

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

OK

Evaporation is the change in water from a liquid to a gas. Degassing is the change CO_2 from gas in the ocean to gas in the atmosphere. They both are moving to the atmosphere but H_2O is changing states

Earn up to 1 additional point on your course grade

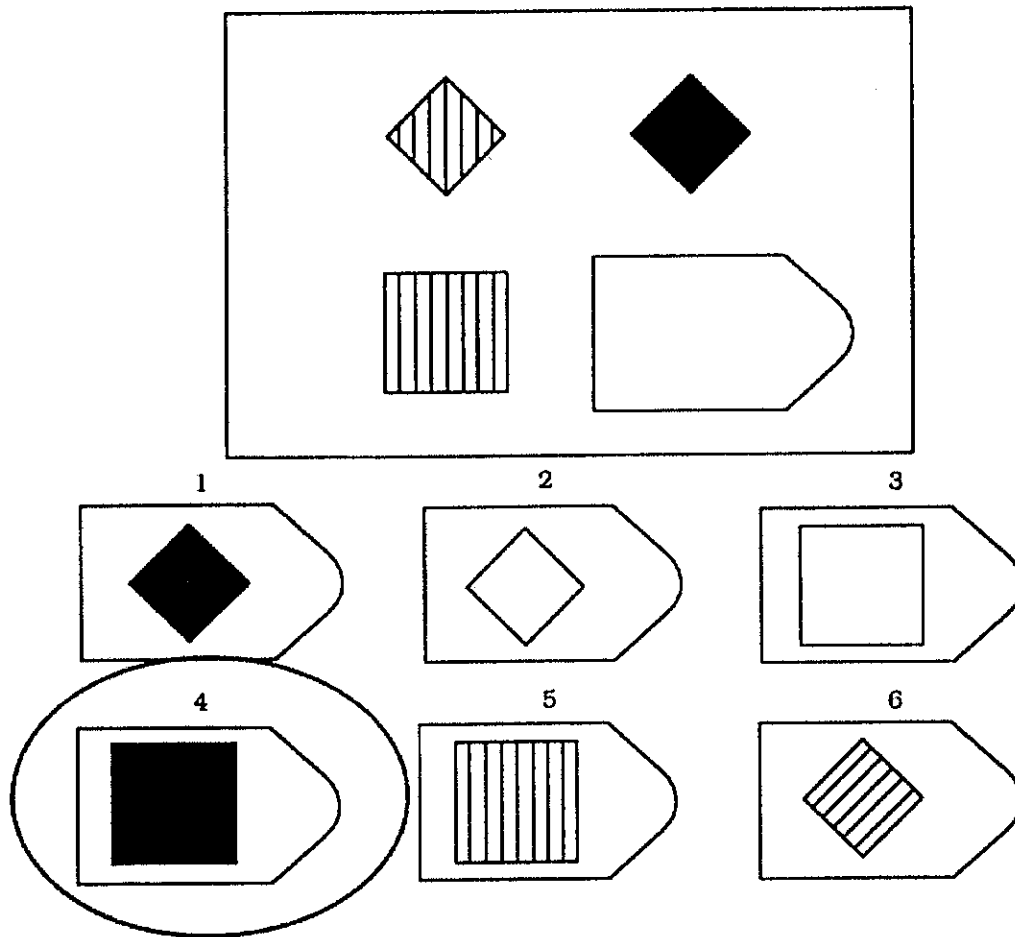
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

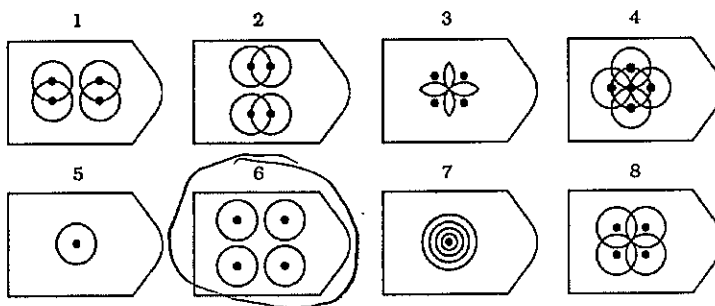
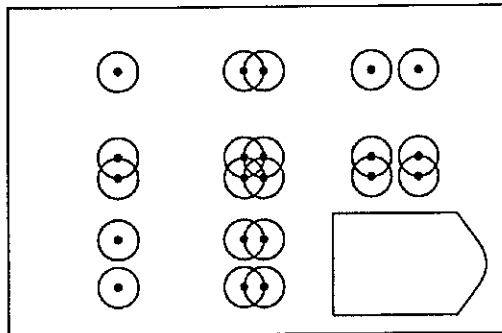


Answer: 4

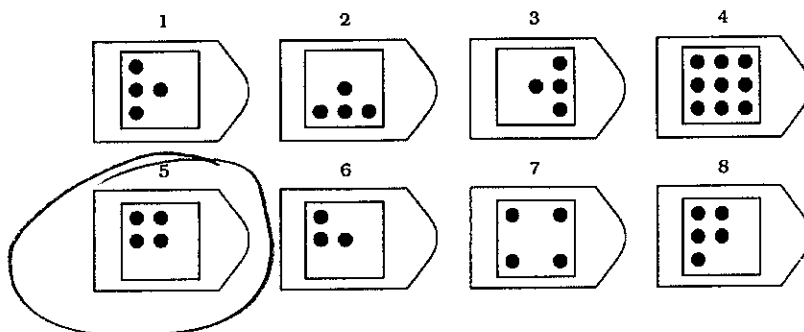
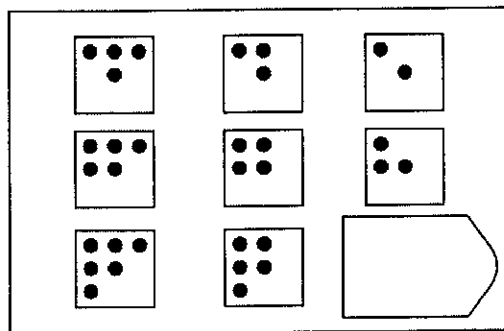
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Please choose the image that best completes each of the following patterns.

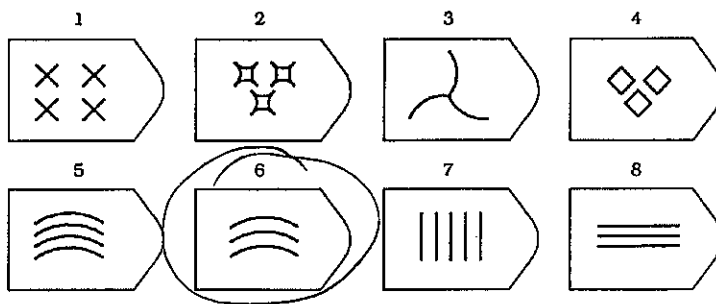
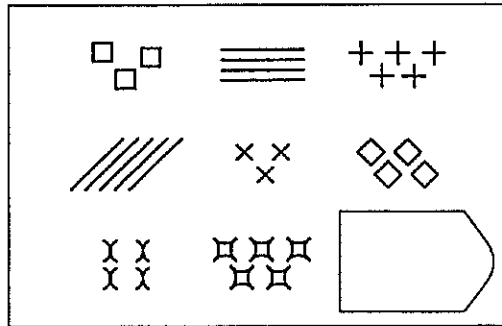
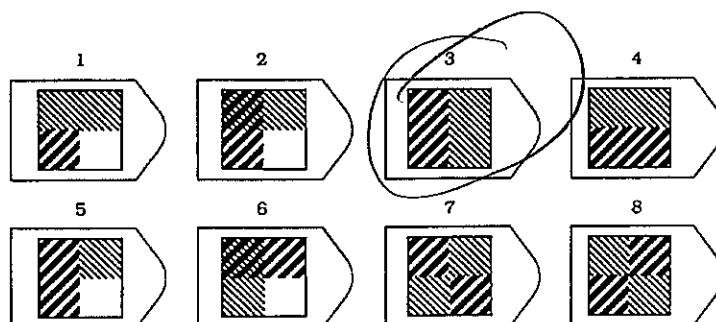
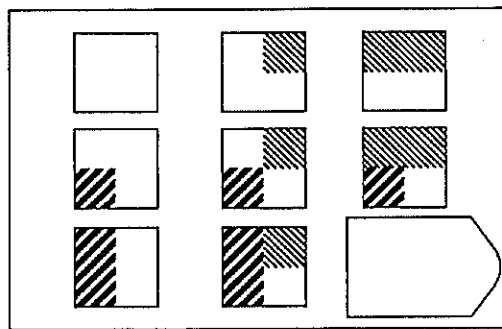
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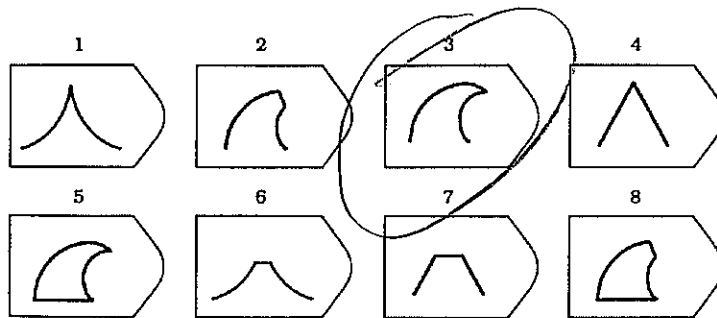
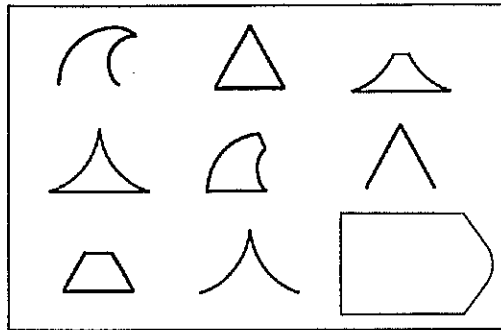


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
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PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- A. While debugging their broken firewall, a programmer came across top-secret CIA files.
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- D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- ☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- A. After eating a big lunch, Dan went back to his office and took a nap.
- B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- ☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
 - ☒ B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
 - C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
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Please choose the response that is closest to an analogy that you might make.

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- B. Hitting your head. They both involve something that causes headaches.
- ☒ C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☒ C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 48393

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A39732455
Version B

GROUP: C23

93

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed ↑
b. Melting of permafrost resulting in more methane escaping into the atmosphere ↑
c. An increase in evaporation and cloud formation resulting in the release of latent heat ↑
☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
- * 2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
a. The magma becoming colder
☒ b. Gas bubbles forming in the magma
c. The surrounding crust becoming hotter
☒ d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
a. A= erosion, B= deposition, C= uplift and erosion
b. A = erosion, B= biochemical precipitation, C= uplift and deposition
☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
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4. Which of the following statements about the greenhouse effect on Earth is most accurate?
a. Human activities are the primary cause of the greenhouse effect.
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c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
d. Neither human activities nor natural processes are important causes of the greenhouse effect.
e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
a. Reservoir A has a shorter residence time than Reservoir B.
☒ b. Reservoir B has a shorter residence time than Reservoir A. $RT = \frac{AMT}{Flow}$
c. Reservoir A and Reservoir B have equal residence times.
d. More information about Reservoir A and Reservoir B is needed.
6. Which of the following would cause the acidity of Earth's oceans to decrease? $A \frac{2}{1} B \frac{1}{1}$
☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.



7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
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- ☒ a. The Earth's atmosphere would become colder than it is today.
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10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
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↑ en released to form

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

22

A) The process of ocean acidification involves carbon entering the ocean in many forms, mainly CO_2 . This CO_2 is then converted into bicarbonate (HCO_3^-) and H^+ ions, which cause ocean acidity. One process that converts CO_2 to HCO_3^- is ~~biochemical precipitation~~. An increase in CO_2 in the atmosphere would result in an increase in ocean acidity, because?

B.) - Positive feedback loops dealing with this would be ^{an} increase in ocean acidification would cause more CO_2 to be degassed into the atm. causing increase temp. ~~2~~ More CO_2 in the atm. means more CO_2 in the ocean, which means increase ocean acidity and so on.

• A negative feedback loop would be increased CO_2 in atm increases both temp. + ocean acidity. increased temp in atm causes increase temp in

✓ oceans. The warmer the water, the less CO_2 it can hold, decreasing acidity, thus negative feedback

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

SS

A.) When a volcano erupts it releases a lot of ash and other things into the atm, one of these is sulfur dioxide. More about this later. When light enters the atm, it is absorbed by certain surfaces and sent back as IR light which equates to heat. This is then trapped? and sent back by greenhouse gases, which heats our planet.

B.) The sulfur dioxide released by the volcano will go up into the atm and reflect light coming in back to space, thus it cannot be absorbed & changed to heat. This results in a decrease in atmospheric temperature. After a while the sulfur dioxide will go away and temp. will begin to increase.

24

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

- Similar: they both involve the movement of molecules, CO_2 from ocean to atm & H_2O from water to atm.
- Diff: in degassing CO_2 does not change states, in evaporation, water goes from liquid to gas.

Earn up to 1 additional point on your course grade

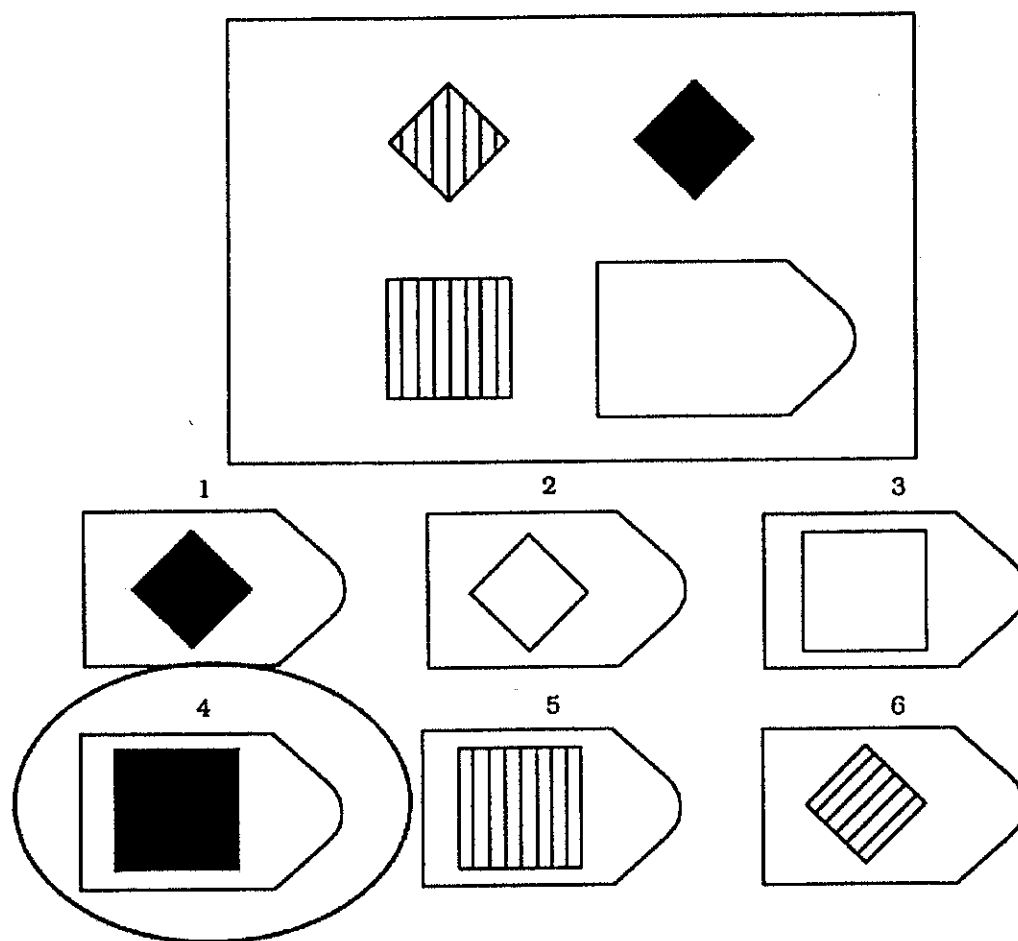
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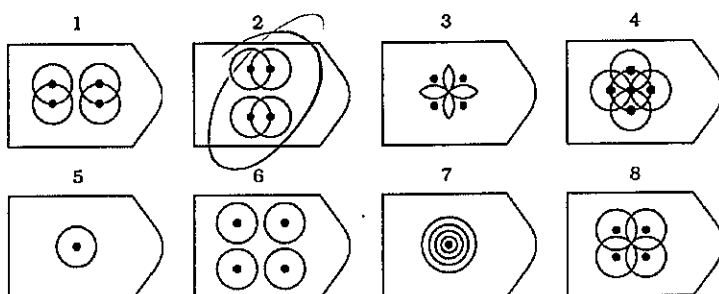
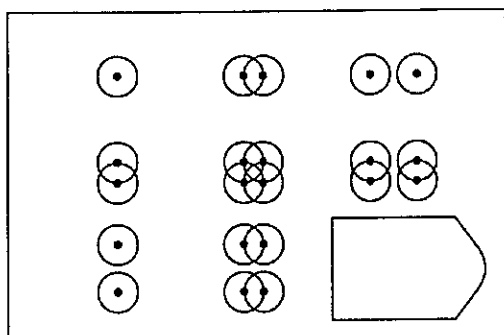


Answer: 4

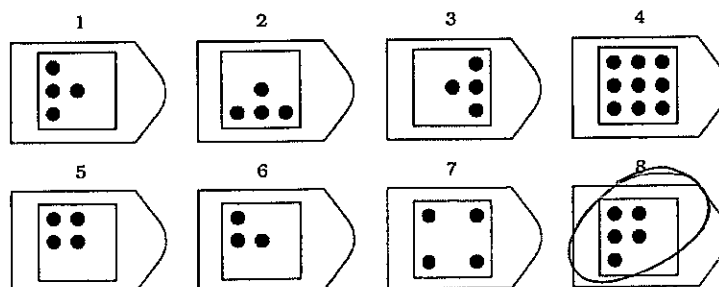
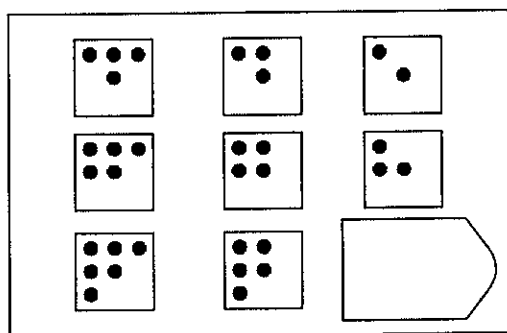
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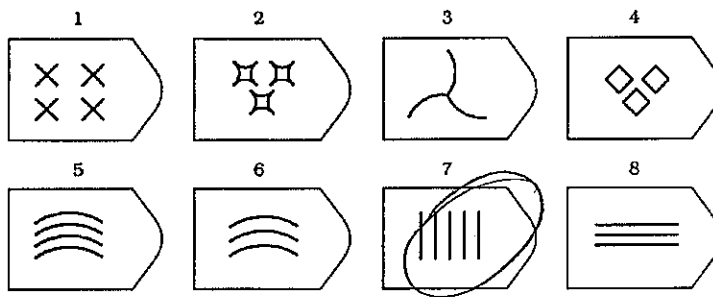
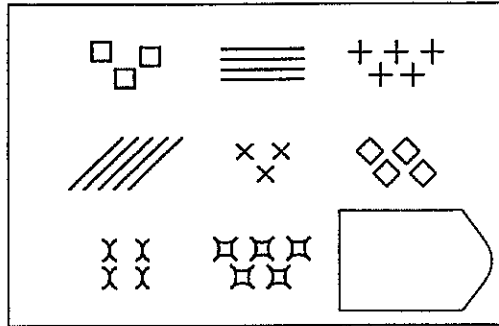


PATTERN 2

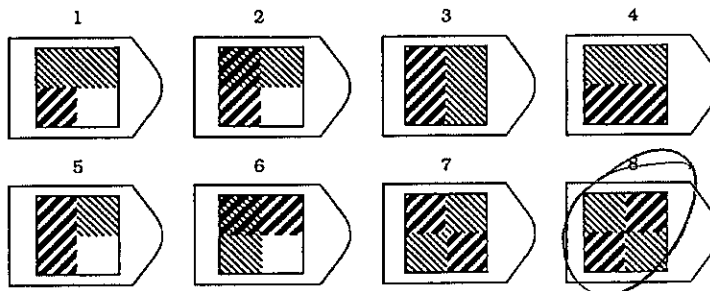
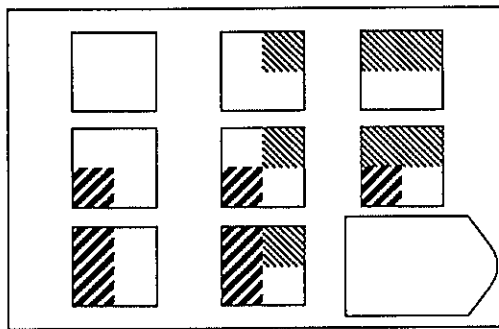


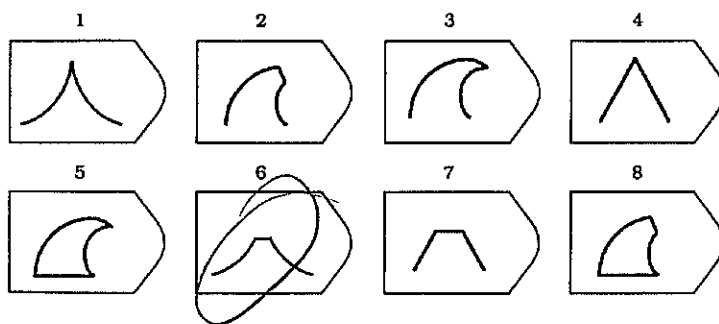
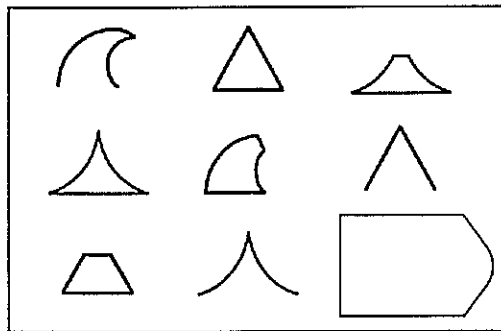
PLEASE CONTINUE ON NEXT PAGE

PATTERN 3



PATTERN 4



PATTERN 5

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Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

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B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.

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D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

B. Bob was able to maximize his work time by cutting back on watching TV during the day.

C. Sean has been closely monitoring his eating in an attempt to improve his diet.

☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.

D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
 - ☒ B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
 - C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
 - D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- ☒ C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☒ C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 22 years

What is your home zip code? 48393

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A 41823312
Version B

GROUP: C23

48

MULTIPLE-CHOICE. 5 points each (50 points total).

- C 1. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
- D 2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
- C 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A = dissolution, B= deposition, C= uplift and deposition
- A 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
- B 5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.
- C 6. Which of the following would cause the acidity of Earth's oceans to decrease?
- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

B 7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- a. The reservoir will eventually disappear.
- ☒ b. The reservoir is not in equilibrium.
- c. The reservoir is growing smaller.
- d. The reservoir's residence time is 10 years.

$$\frac{1000}{100} = 10$$

$$\frac{1000}{50} = 20$$

A 8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- ☒ a. The Earth's atmosphere would become colder than it is today.
- b. The Earth's atmosphere would become warmer than it is today.
- c. The Earth's atmosphere would remain about the same temperature as it is today.
- d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

A 9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- ~~b. Reflection of more solar radiation, causing atmospheric temperature to increase~~
- ~~c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase~~
- d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

C 10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- ~~a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.~~
- ~~b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.~~
- ☒ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
- ~~d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.~~

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide would effect the ocean by more CO_2 entering the ocean. $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{HCO}_3^- + \text{H}^+$ refers to this because with more carbon dioxide in the air (more heat would be in the air as well causing increased evaporation, also more CO_2 would enter into the water increasing its residence time. Ocean acidification is the decrease of pH levels because of an increase in carbon dioxide. A positive feedback loop would be that the increased carbon dioxide in the atmosphere would increase CO_2 in the ocean & increase temperatures of both. A negative feedback would be more clouds forming in the atmosphere due to increased evaporation & possible increase of hurricanes, & other precipitation events which increase pH levels in the ocean.

84

20

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The increased ash clouds into the atmosphere would contribute to more CO_2 release into the atmosphere as well. With more carbon dioxide into the air, solar energy would have a higher residence time in the atmosphere, making temperature rise.



This is almost exactly the case of the greenhouse effect but at higher levels. The greenhouse effect heats the earth due to increased carbon dioxide absorption of energy, rather than lesser levels of carbon dioxide being released back into space. With the large ash clouds, carbon dioxide would be more prevalent in the air, and with absorption of energy comes more heat.

88

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is the release of water molecules in a gaseous state into the atmosphere, while degassing releases other substances into the atmosphere because of increased temperature.

Earn up to 1 additional point on your course grade

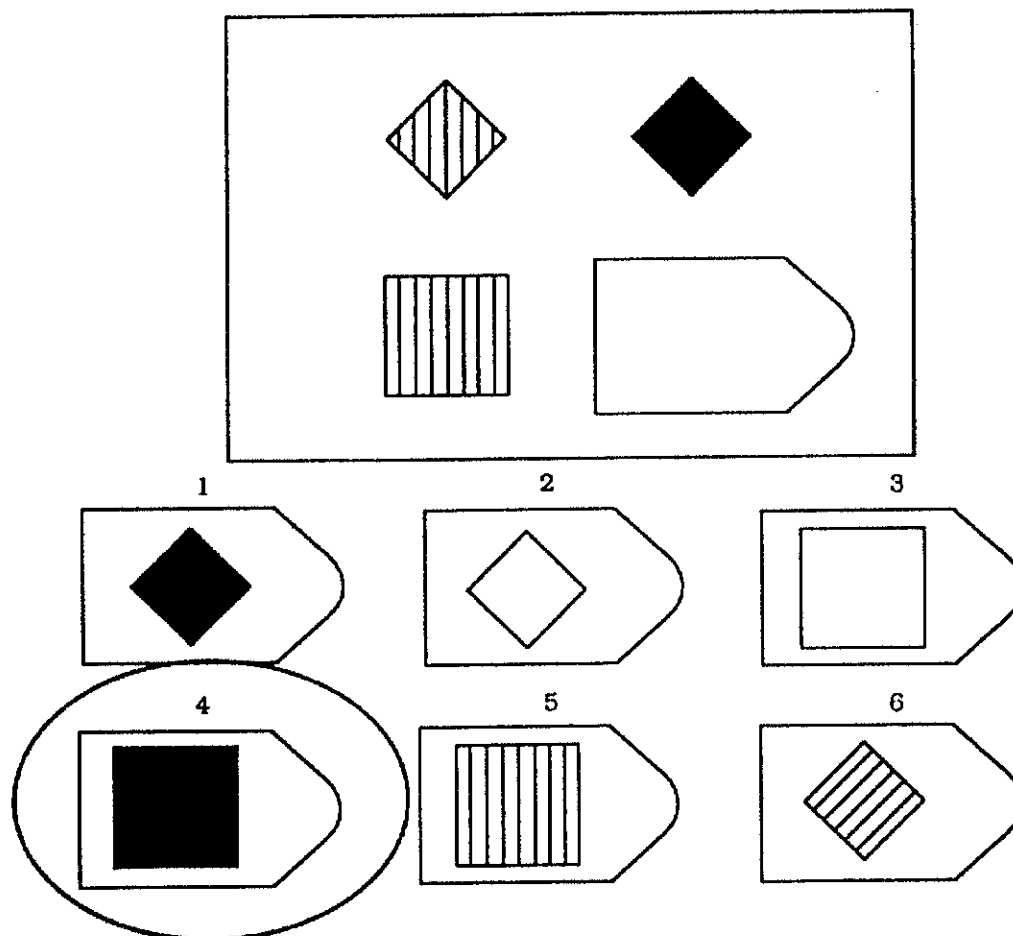
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

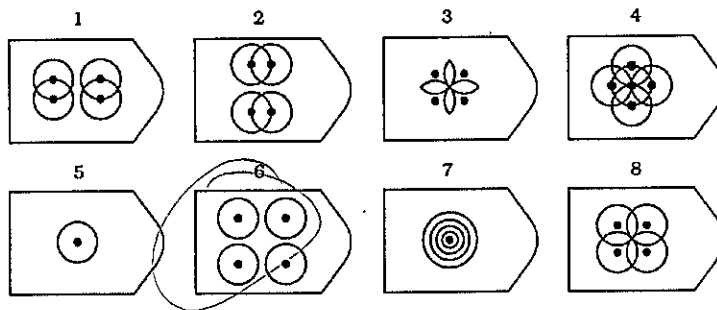
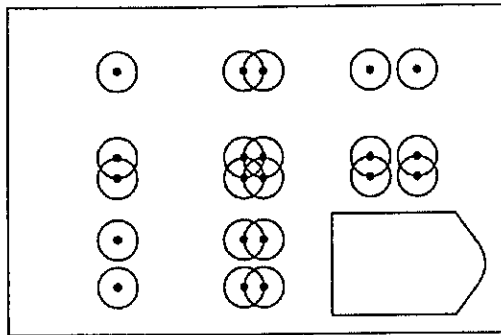


Answer: 4

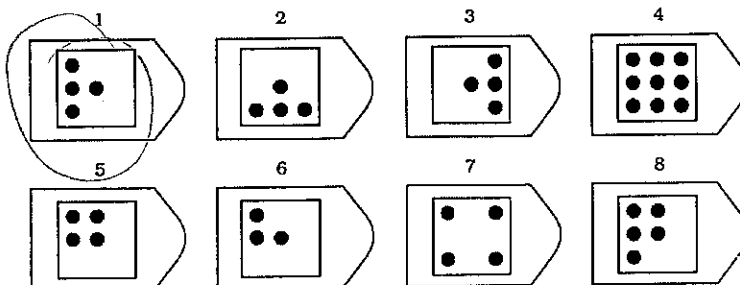
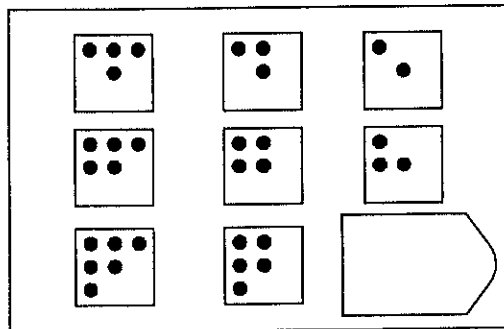
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Please choose the image that best completes each of the following patterns.

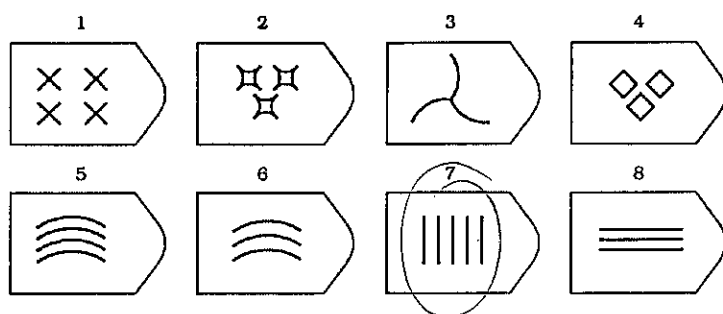
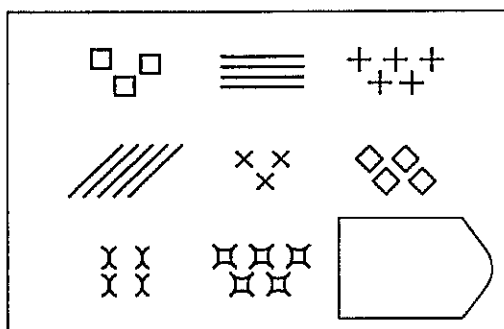
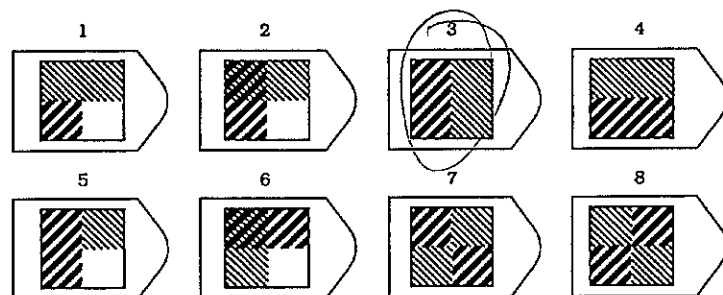
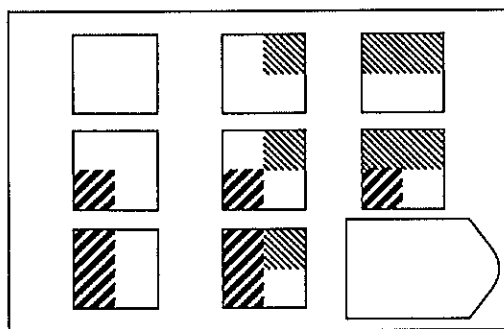
PATTERN 1

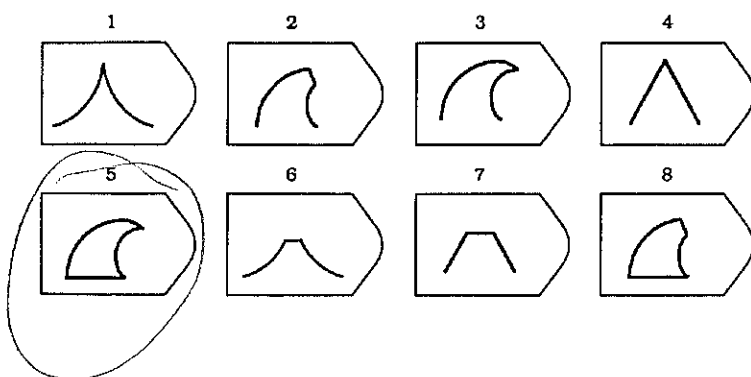
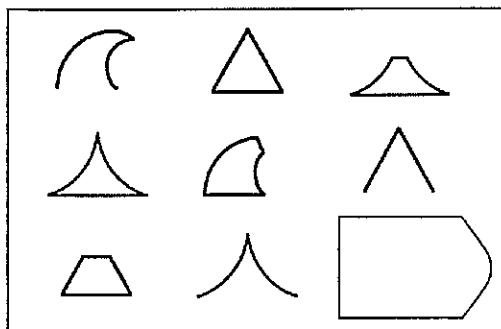


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

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- A. After eating a big lunch, Dan went back to his office and took a nap.
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PLEASE CONTINUE ON NEXT PAGE

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E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

A. Dew forming. They are similar because they both involve a drop in temperature.

B. Blowing up a balloon. They are similar because they both involve becoming less dense.

☒ C. Clouds forming. They are similar because they both involve a phase change.

D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? _____

What is your gender?

☐ Male

☒ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☒ Caucasian

☐ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A40208496
Version B

GROUP: C24

84

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- ☐ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - ☒ b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☐ d. An increase in desert formation resulting in more dusting blowing into the atmosphere

2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- ☐ a. The magma becoming colder
 - ☒ b. Gas bubbles forming in the magma
 - ☐ c. The surrounding crust becoming hotter
 - ☐ d. Crystals forming in the magma

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- ☐ a. A= erosion, B= deposition, C= uplift and erosion
- ☐ b. A= erosion, B= biochemical precipitation, C= uplift and deposition
- ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
- ☐ d. A= dissolution, B= deposition, C= uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- ☒ a. Human activities are the primary cause of the greenhouse effect.
 - ☐ b. Natural processes are the primary cause of the greenhouse effect.
 - ☐ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - ☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - ☐ e. The human and natural causes of the greenhouse effect are not understood.

5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- ☐ a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - ☐ c. Reservoir A and Reservoir B have equal residence times.
 - ☐ d. More information about Reservoir A and Reservoir B is needed.

6. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - ☐ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year. Which of the following statements is true?

- $\frac{1000}{100} = 10$
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- ☒ a. The Earth's atmosphere would become colder than it is today.
- b. The Earth's atmosphere would become warmer than it is today.
- c. The Earth's atmosphere would remain about the same temperature as it is today.
- d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- b. Reflection of more solar radiation, causing atmospheric temperature to increase
- c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
- d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
- ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
- c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
- d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

Cold water
warm water.

A40208496

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

3

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

24

An increase in atmospheric carbon dioxide will increase the oceanic acidification. The acidification of the oceans occurs when carbon dioxide (CO_2) adds up with water, creating HCO_3^- or acid. An increase in carbon dioxide in atmosphere will cause an increase of carbon dioxide in the ocean through ~~permeation~~ ^{permeation}. However, it is important to notice the importance of the ~~oceanic~~ oceanic water temperature. Carbon dioxide dissolves faster in the cold water faster, because the molecules of in the cold water do not vibrate as fast as the molecules in warm water. Because the vibration pushes out the carbon dioxide and not letting it to dissolve. If the carbon dioxide increases in the atmosphere it will cause the Earth's temperature to rise, as well as the oceanic water temperature to rise. Therefore not allowing as much carbon dioxide to dissolve in the warm oceanic water & push the CO_2 back into atmosphere. ^{to keep the equilibrium} If not considering the water temperature, then the acidification would increase.

The positive feedback loop in the process of oceanic acidification is caused by the process moving in the same direction & creating more change. More CO_2 in atmosphere, \rightarrow causes more CO_2 enter ocean \rightarrow causes more interaction b/ H_2O & $\text{CO}_2 \rightarrow$ causes more acidification. \rightarrow causes more disequilibrium b/ the systems \rightarrow causes more threat to marine life. All changes are moving towards the same direction \rightarrow bad direction.

The negative feedback loop - would be the idea of trying to balance the systems, when two processes are going in opposite direction. The idea of increasing temperature & the movement of CO_2 in opposite direction.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature? *it would block the light but increase CO₂ eruption.*

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

Lithosphere, where the volcanoes come from, are the biggest reservoir of carbon dioxide, because of the limestone. When volcano erupts it releases a big amount of carbon dioxide into the atmosphere. Carbon dioxide is one of the main greenhouse gases that trap the heat from escaping the earth & keeping life on earth. However with more CO₂ in the atmosphere less heat will be able to escape or re-emit into the space. With the natural process the greenhouse effect receives heat from the solar energy, visible wavelength from the sun. Some of the heat is absorbed by the earth's surface ^{keeping} necessary temperature on earth, & some energy is reflected by into the space. However, because of increase in volcanic eruptions on earth would increase O₂ in the atmosphere, the atmospheric temperature would increase. However, the large ash clouds will play the role of blockers. ~~The~~ The ash will create clouds in the atmosphere blocking the ~~the~~ solar light, and reflecting it to the space. Which may slow down the greenhouse effect. In one of the lecture readings I have read that scientists want to use the volcanic ash clouds to slow down the greenhouse effect & the process of sunlight entering the earth's surface. However the ash clouds do not stay in the atmosphere forever. After a while they dissolve.

23

The question you asked may have two answers if connecting all the possible processes. If talking just about ~~as~~ large amount of ash clouds & greenhouse effect then the temperature would decrease, because the ash clouds will block solar radiation. But if talking about

2 Extra credit (2 points). how much CO₂ will be released because of volcanic eruption
How are evaporation and degassing similar and/or different? & ash clouds would dissolve →

Evaporation - is the process when liquid water becomes gas, in the atmosphere.
Degassing - is ~~the~~ a similar process in the way is that it releases gas into atmosphere.
The difference is that evaporation has to do with water cycle, and degassing has to do

The negative feedback loop could be explained as followed:
increase in carbon dioxide in atmosphere \rightarrow increase in earth's temperature \rightarrow increase in ocean temperature \rightarrow more molecule vibration \rightarrow less carbon dioxide dissolution due to more molecule vibration; because ~~more~~ more vibration kicks the CO₂ out into atmosphere \rightarrow this negative feedback loop is trying to keep the equilibrium in the oceanic system.

Earn up to 1 additional point on your course grade

[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Essay

Question 2: with time then the temperature would increase.

Ash clouds play a role of negative feedback loop in keeping the greenhouse affect to increase by blocking the solar radiation, therefore decreasing atmospheric temperature.

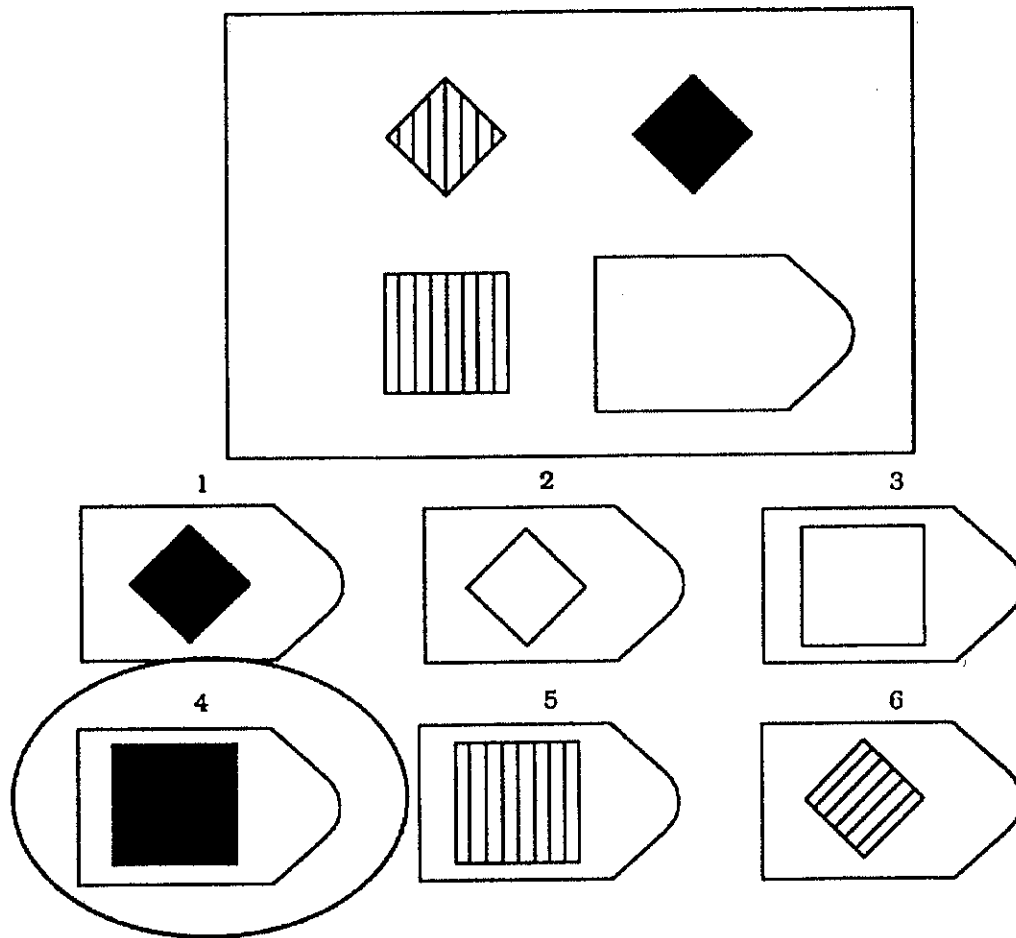
However, the positive feedback loop would be more volcanism, releasing more CO₂, increasing the ~~ice~~ temperature.

The processes of dissolving limestone due to change in pressure, temp, or composition, causing degassing of Carbon dioxide into atmosphere.

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

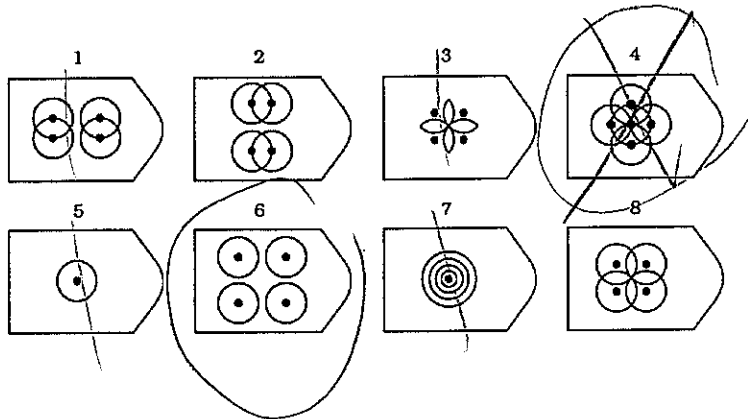
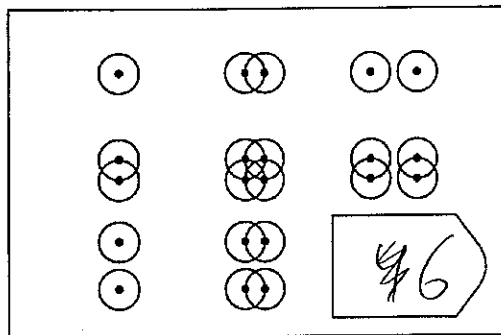


Answer: 4

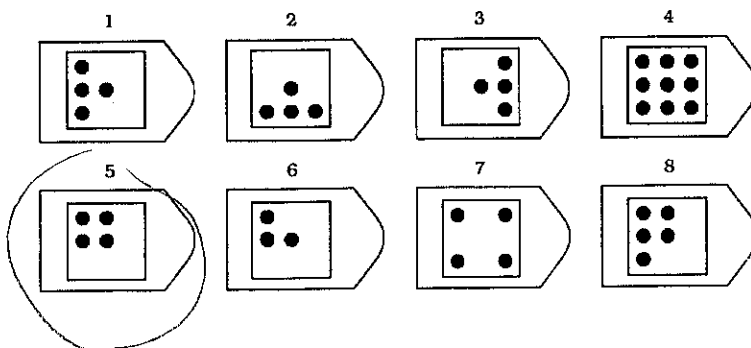
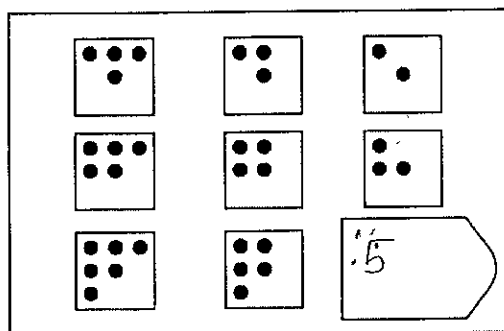
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

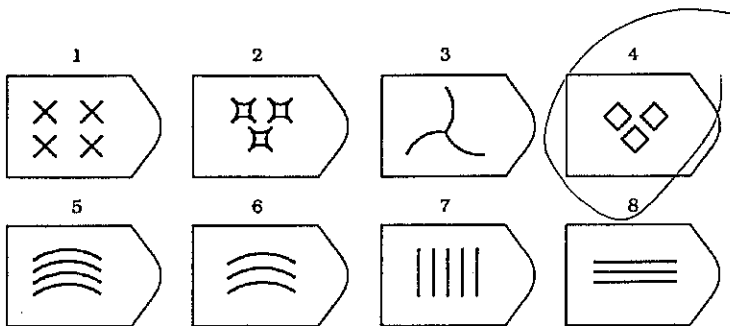
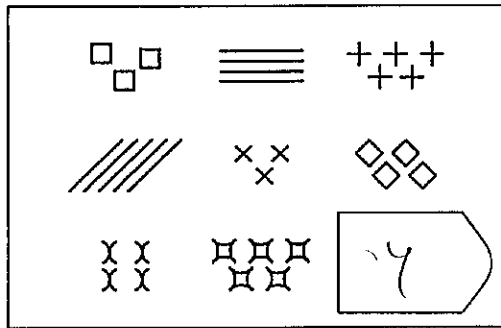
PATTERN 1



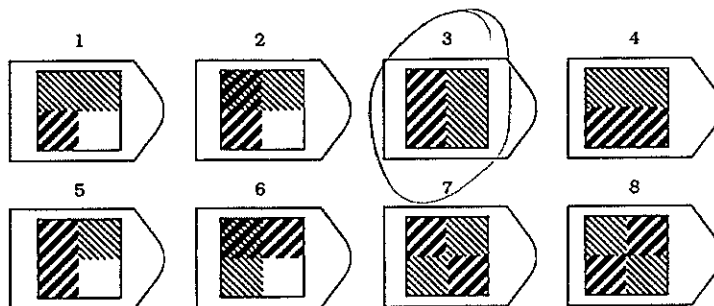
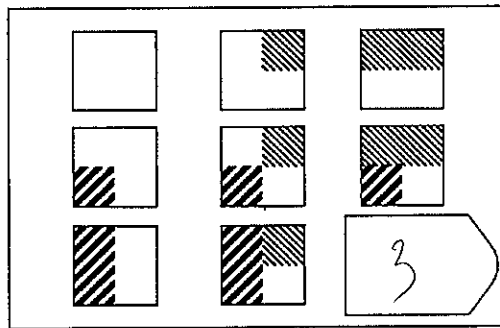
PATTERN 2



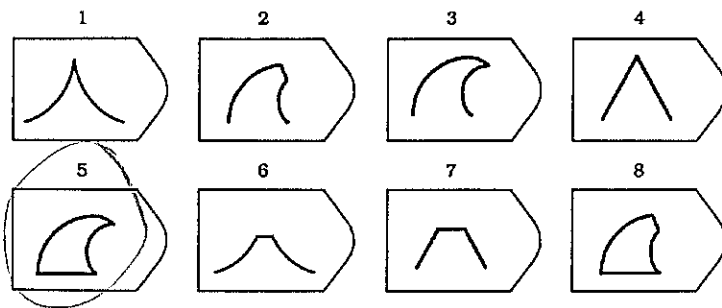
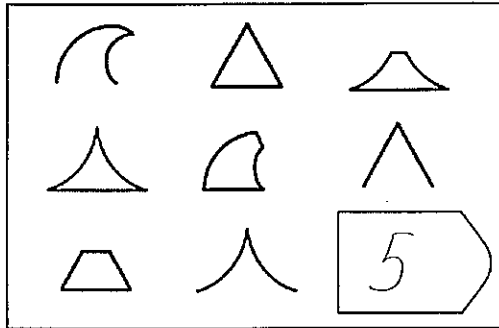
PATTERN 3



PATTERN 4



PATTERN 5



In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- ☒ C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- ☒ D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- ☒ B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- ☒ A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- ☒ B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- ☒ C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- A. After eating a big lunch, Dan went back to his office and took a nap.
- ☒ B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- ☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
 - B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
 - C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
 - D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- ☒ A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☒ C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 22 years

What is your home zip code? 48823

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A43091747
Version B

GROUP: C24

17

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - ☒ Melting of permafrost resulting in more methane escaping into the atmosphere
 - An increase in evaporation and cloud formation resulting in the release of latent heat
 - An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- The magma becoming colder
 - Gas bubbles forming in the magma
 - ☒ The surrounding crust becoming hotter
 - Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- A = erosion, B = deposition, C = uplift and erosion
 - A = erosion, B = biochemical precipitation, C = uplift and deposition
 - A = dissolution, B = biochemical precipitation, C = uplift and erosion
 - ☒ A = dissolution, B = deposition, C = uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- Human activities are the primary cause of the greenhouse effect.
 - Natural processes are the primary cause of the greenhouse effect.
 - ☒ Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - Neither human activities nor natural processes are important causes of the greenhouse effect.
 - The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- Reservoir A has a shorter residence time than Reservoir B.
 - ☒ Reservoir B has a shorter residence time than Reservoir A.
 - Reservoir A and Reservoir B have equal residence times.
 - More information about Reservoir A and Reservoir B is needed.
6. Which of the following would cause the acidity of Earth's oceans to decrease?
- An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - ☒ A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - ☒ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Atmospheric carbon dioxide
could easily be dissolved
in clouds and be released
through precipitation. After
reaching the surface it
could runoff into the ocean
water, increasing the ocean's
acidification. Ocean acidification
can negatively affect the marine-
life causing fatalities, hence
affecting parts of the foodchain.
~~could release~~ An increase
in CO_2 could also mean the formation
of other chemicals.

~~1~~ 1

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The increase in volcanism will cause Earth's atmospheric temperature to rise. The large ash clouds give off thermal energy, increasing the atmosphere's temperature as it reaches it. Of course as heat rises it cools, therefore it won't greatly increase the atmosphere's temperature but indeed will. As learned previously, the temperatures of both will soon ~~reach~~ reach equilibrium.

1

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Both are giving off energy thermally. Evaporation has a direct relationship w/ water.

Earn up to 1 additional point on your course grade

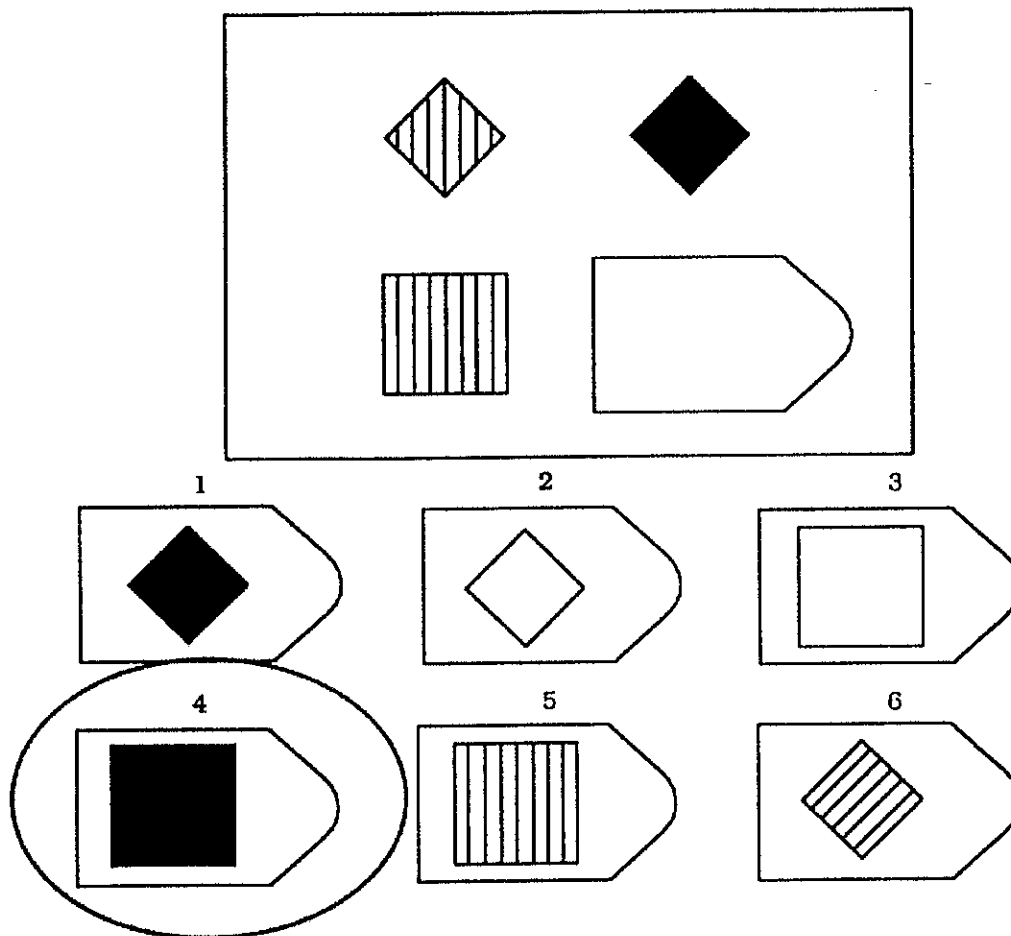
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

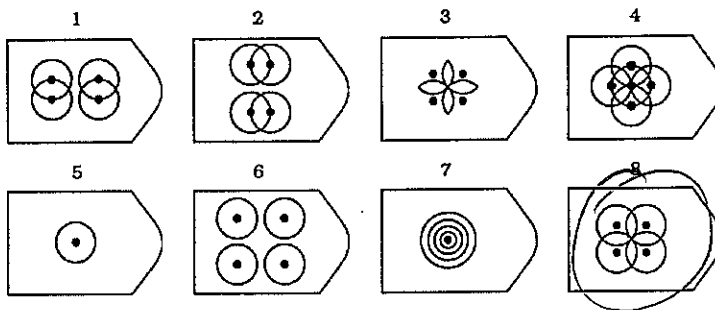
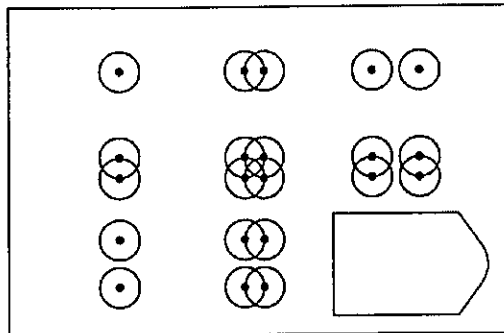


Answer: 4

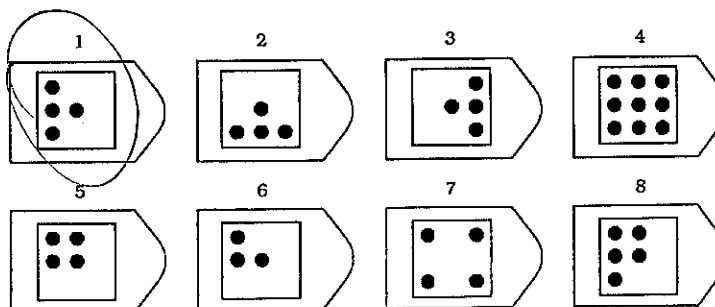
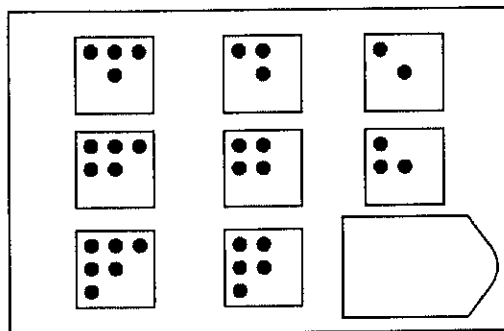
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

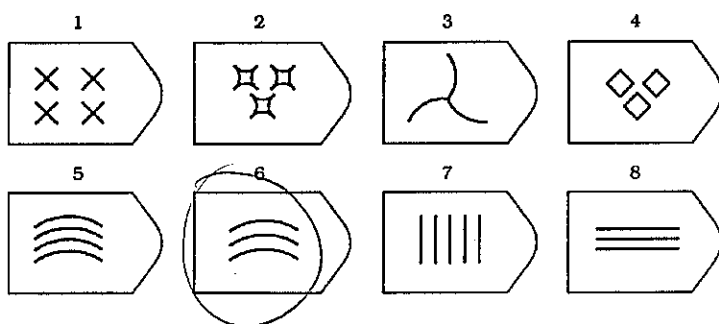
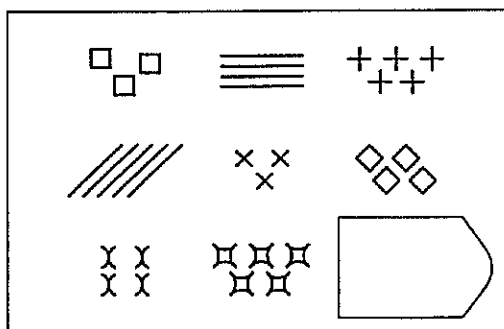
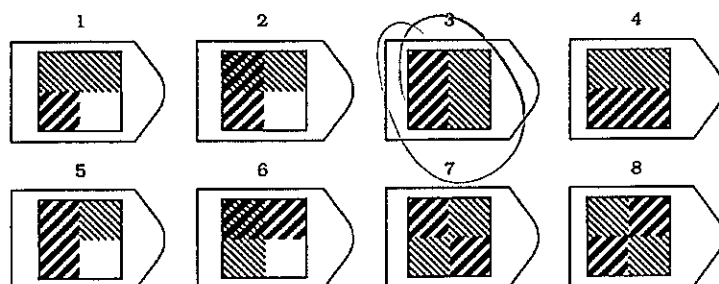
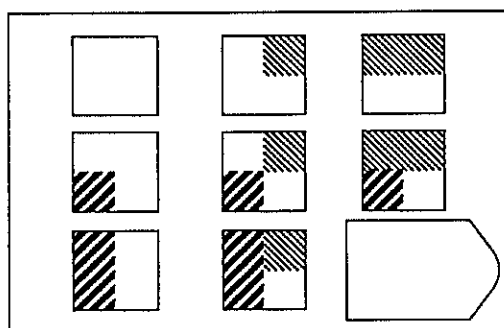
PATTERN 1

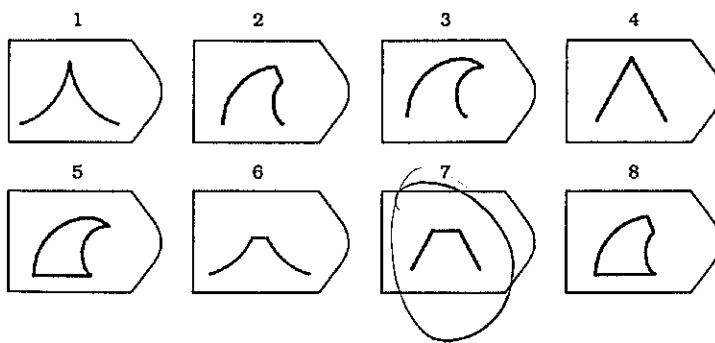
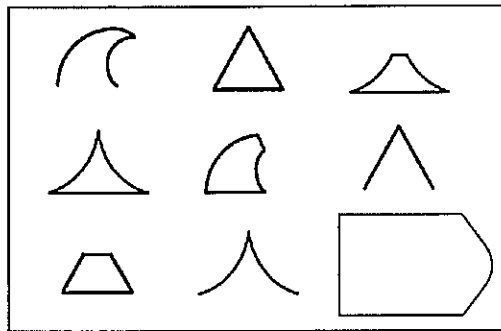


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

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PLEASE CONTINUE ON NEXT PAGE

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2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- ☒ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48034

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☒ African American/Black
- ☐ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A41136895
Version B

GROUP

C24

60

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed ✓
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere ✓
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere

2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma

CaCO_3

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- a. A = erosion, B = deposition, C = uplift and erosion
- b. A = erosion, B = biochemical precipitation, C = uplift and deposition
- c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
- d. A = dissolution, B = deposition, C = uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect. ✓
 - b. Natural processes are the primary cause of the greenhouse effect. ✗
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect. ✗
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
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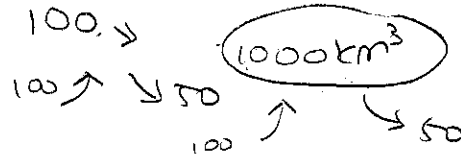
5. Imagine two CO_2 reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO_2 influx and CO_2 outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

4 10 2
20 5 5
2A > B
↓↑ = ↑↓
5 5

6. Which of the following would cause the acidity of Earth's oceans to decrease?
- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash. ✗
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun. ✗

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?

- a. The reservoir will eventually disappear. ✓
B b. The reservoir is not in equilibrium. ✓
c. The reservoir is growing smaller. ✗
d. The reservoir's residence time is 10 years. ✓



8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- A a. The Earth's atmosphere would become colder than it is today. ✓
b. The Earth's atmosphere would become warmer than it is today. ✗
c. The Earth's atmosphere would remain about the same temperature as it is today. ✗
d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

no more CO_2 → lower temp.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- A a. Reflection of more solar radiation, causing atmospheric temperature to decrease
b. Reflection of more solar radiation, causing atmospheric temperature to increase
c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
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10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- D a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
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SHORT ANSWER. 25 points each (50 points total)

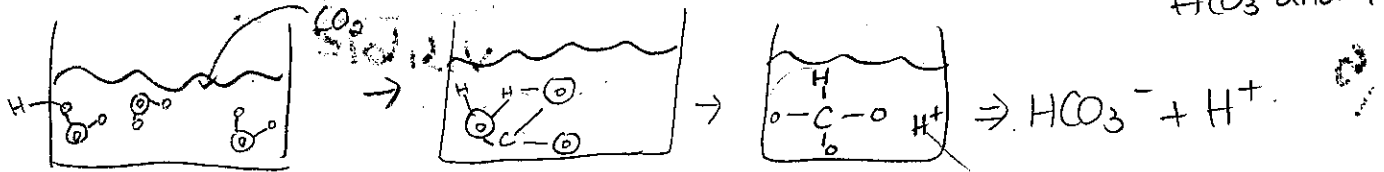
1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

20

(A) When ocean gets CO_2 from the crust or precipitation or the air, CO_2 combines with oxygen^(o) of H_2O and one hydrogen (H) it results HCO_3^- , acid. and water molecule (H_2O) will break to HCO_3^- and H^+



HCO_3^- is acid so the ocean acidification will occur when CO_2 get in to ocean somehow.

(B) When ocean acidification larger, it means more CO_2 is getting into the ocean, so it means many CO_2 is coming somehow. therefore, more CO_2 can results more greenhouse gases.

so it will increase atmosphere's temperature \rightarrow negative feedback loops

when ocean acidification gets small amount,

it means less CO_2 is getting into the ocean.

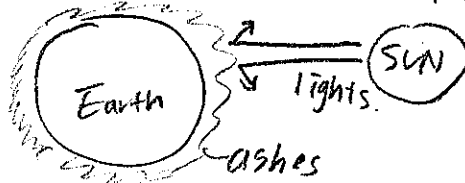
it means less CO_2 is staying outside, and it will make less greenhouse gases so it will decrease atmosphere's temperature \rightarrow positive feedback loops

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

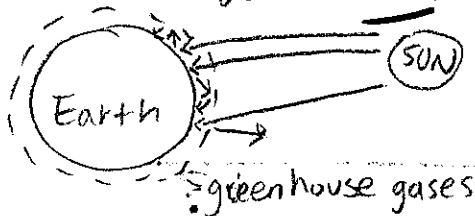
Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

① If the volcano erupt and make huge amount of ashes, it will stay on the atmosphere. Therefore, the temperature of the atmosphere will decrease because it will block the infrared lights from the sun.

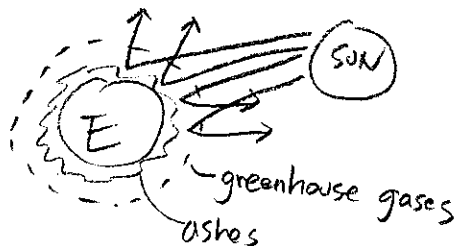


The greenhouse effect contains the infrared lights from the sun. Usually some of lights should be reflect and get out to outside of atmosphere. However, the greenhouse gases with CO_2 will block the reflection, so it couldn't get out.



So the temperature of the Earth will increase if greenhouse effect present.

- ② Now, greenhouse effect is getting worse, however, if the volcano erupts and make lots of ashes it will make the temperature lower. it is positive feedback loops.



Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation and degassing both are something turns to gas. However, Evaporation occurs liquid direct to gas and degassing is elements in the solid acts together with other element and turn into gas.

Earn up to 1 additional point on your course grade

[ex. a 79% becomes an 80%]

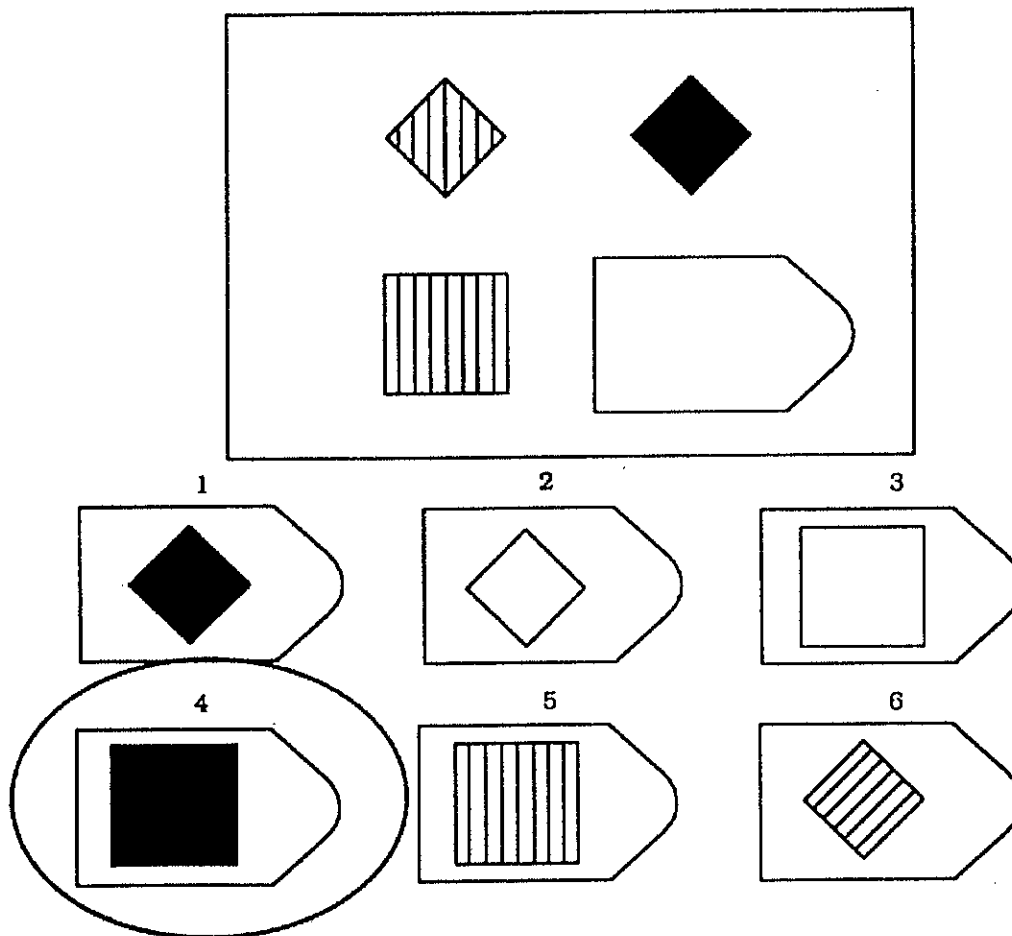
Thoughtfully complete the attached survey

Analogical Assessment

~~121136895~~
A41176895

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

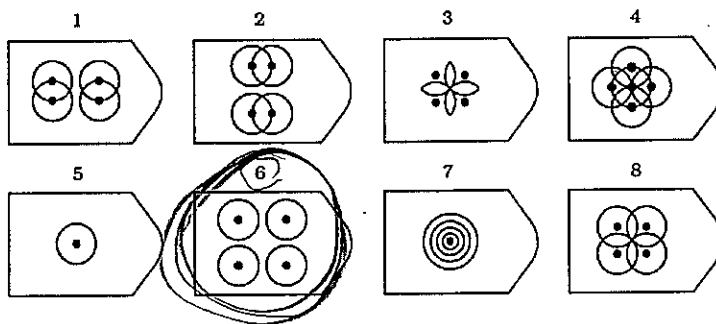
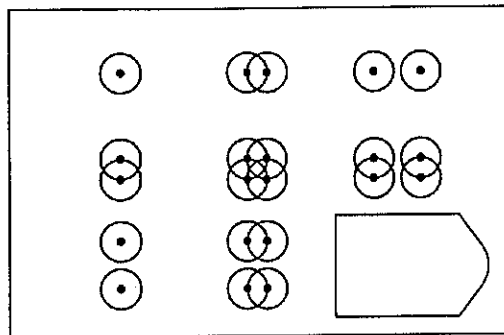


Answer: 4

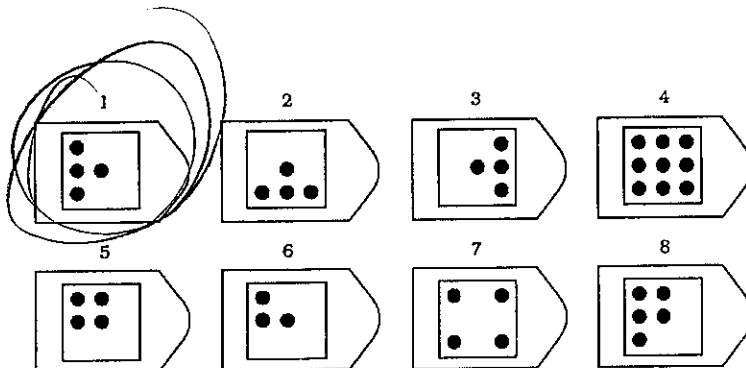
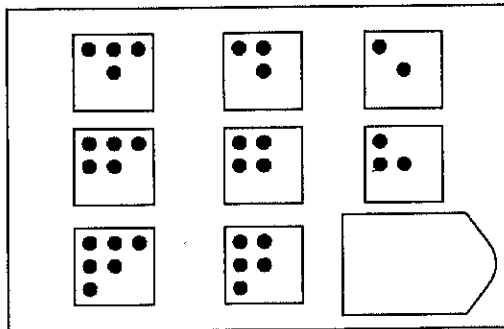
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

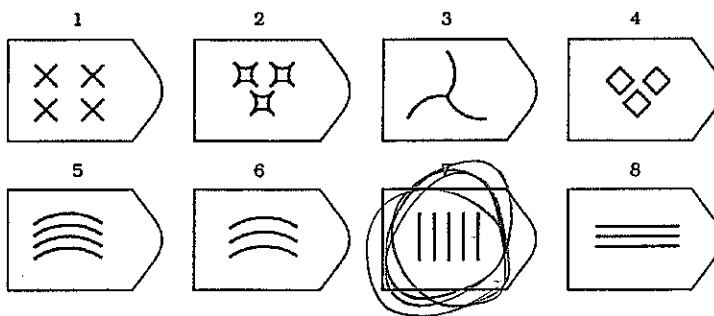
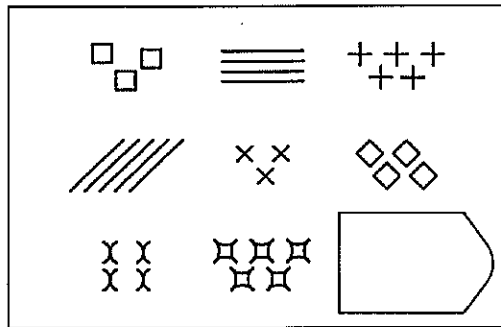
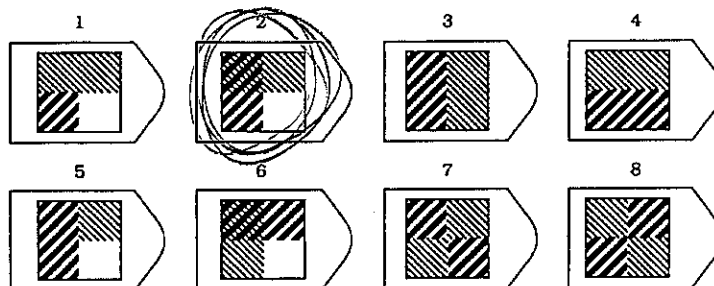
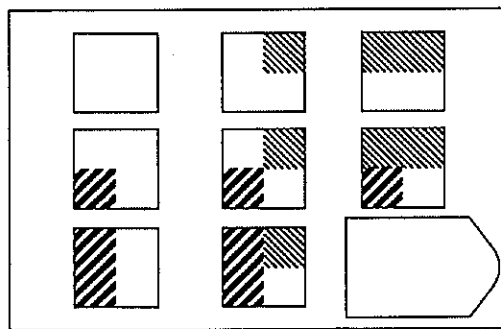
PATTERN 1

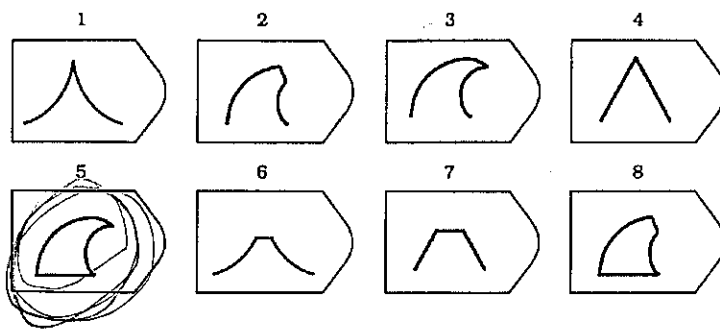
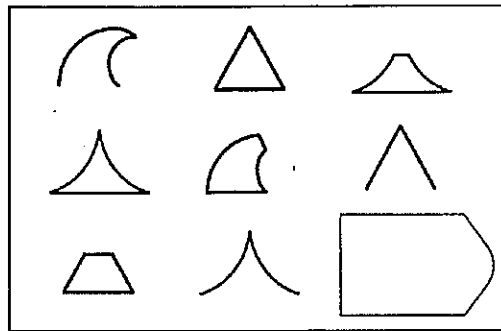


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
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2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
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- C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy-anniversary dinner by eating cheaply for the week beforehand.

- A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- ☒ B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- A. After eating a big lunch, Dan went back to his office and took a nap.
- B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- ☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
 - B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
 - ☒ C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
 - D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- ☒ A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- ☒ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 480627.

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☐ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☒ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

I went to
the review
session
before
class :)

STUDENT NAME: A43707708
Version B

GROUP: C25

97

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- ☒ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
- ☒ b. Melting of permafrost resulting in more methane escaping into the atmosphere
- ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
- ☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- ☒ a. The magma becoming colder
- ☒ b. Gas bubbles forming in the magma
- ☐ c. The surrounding crust becoming hotter
- ☐ d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- ☒ a. A = erosion, B = deposition, C = uplift and erosion
- ☒ b. A = erosion, B = biochemical precipitation, C = uplift and deposition
- ☒ c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
- ☐ d. A = dissolution, B = deposition, C = uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- ☒ a. Human activities are the primary cause of the greenhouse effect.
- ☒ b. Natural processes are the primary cause of the greenhouse effect.
- ☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
- ☒ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
- ☒ e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- ☒ a. Reservoir A has a shorter residence time than Reservoir B.
- ☒ b. Reservoir B has a shorter residence time than Reservoir A.
- ☐ c. Reservoir A and Reservoir B have equal residence times.
- ☐ d. More information about Reservoir A and Reservoir B is needed.
6. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
- ☒ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
- ☒ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

$$RT = \frac{\text{size}}{\text{flux}}$$

$$R.T(A) = \frac{2}{1}$$

$$R.T(B) = \frac{1}{1}$$



7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- B
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- C
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - ☒ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- A
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- B
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

energy is needed to form bonds
chemical energy is needed to change
from gas \rightarrow L

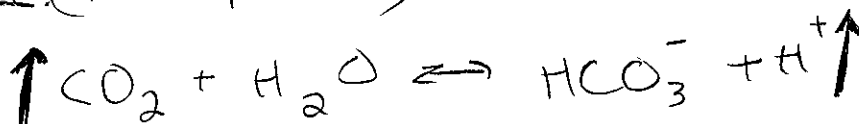
SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Ocean acidification is when carbon dioxide and water combine to form a bicarbonate and hydrogen, which hydrogen is an indicator of how acidic (or how much CO_2 the ocean is, or its pH level). The more CO_2 in the atmosphere, the more acidic the ocean will be. With an increase in atmospheric carbon dioxide, the acidity of the ocean will increase as well. When there is an increase in atmospheric CO_2 , there is an increase in atmos. Temperature, which will increase the ocean water temperature. This is an example of positive feedback because the output of acidity and temperature are increasing further. BUT, because the atmospheric temp. is increasing, the oceanic temperature is increasing as well, which prevents the oceans from being easily acidified and reduces ocean acidification or the amount of CO_2 in the water. This is an example of negative feedback, because the output of oceanic acidification is now decreasing instead of increasing. Overall, the increase in atmospheric CO_2 will increase ocean acidification, but more slowly than normal due to the fact that ocean acidification increases when water is colder. (more pocket)



25

OK

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

Volcanism releases CO_2 into the atmosphere, which when increasing will cause more CO_2 to be in the atmosphere. This would initially cause temperature to increase in the atmosphere. Visible solar radiation warms the earth coming from the sun, which visible solar energy is not absorbed well by molecules in the earth's atmosphere and make it to earth's surface. They then are absorbed and also reflected back up into space, but the absorbed vis. solar radiation is re-emitted as infrared, which the G.G. absorbs and scatter re-emitted infrared heat back towards earth. The greenhouse gas molecules "trap" infrared radiation, and by also allowing a bit to escape, which allows the earth's heat to be regulated. (not blazing hot in the day, freezing @ night). The build up of CO_2 would add to the greenhouse gases, but the large ash clouds will block out solar energy, and not allow sunlight to make it to the surface. Overall, the volcano will not exactly heat the atmos. but instead cool the atmosphere by not allowing sunlight through and blocking out the emitted solar radiation from the sun.

25

Extra credit (2 points).

2 How are evaporation and degassing similar and/or different?

evaporation + degassing both have final result of gas ending up in the atmosphere, but degassing starts with gas in the ocean and transfers to gas in the atmosphere, while evaporation starts as a liquid \rightarrow gas.

Earn up to 1 additional point on your course grade

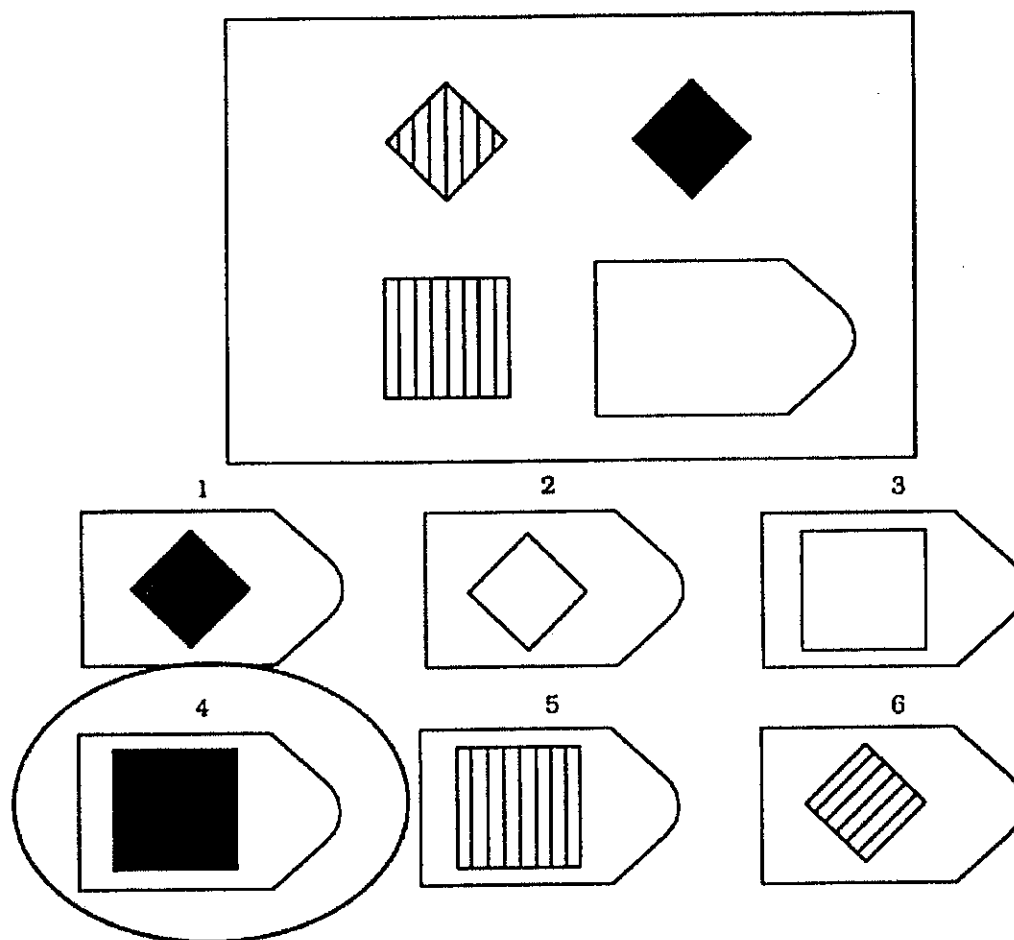
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

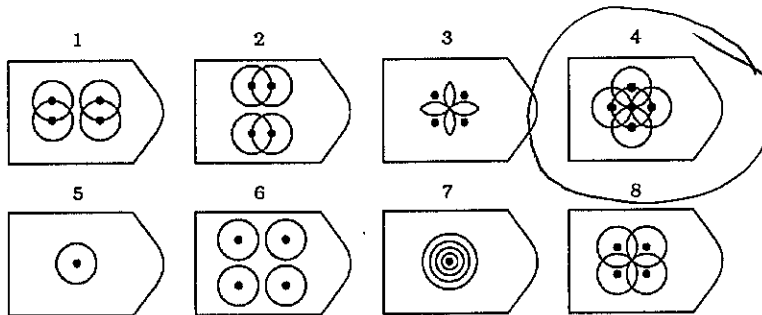
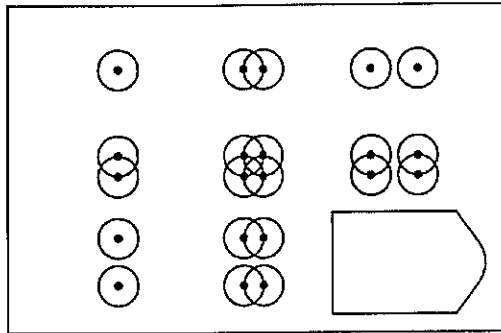


Answer: 4

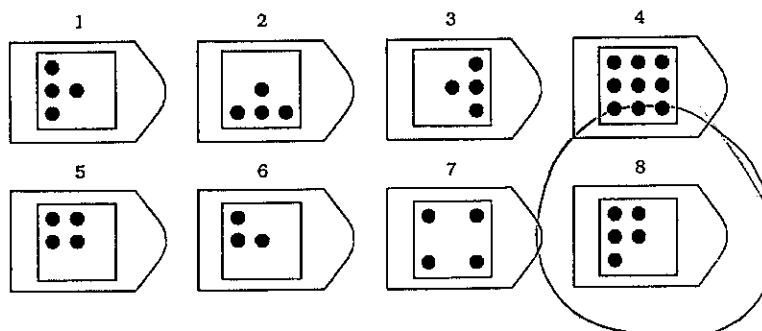
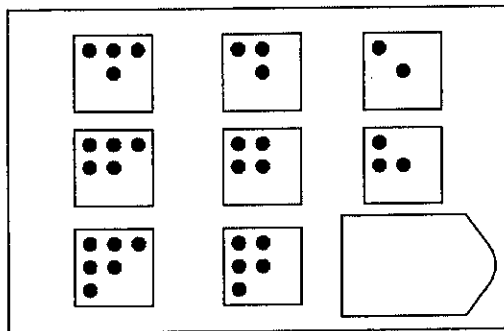
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

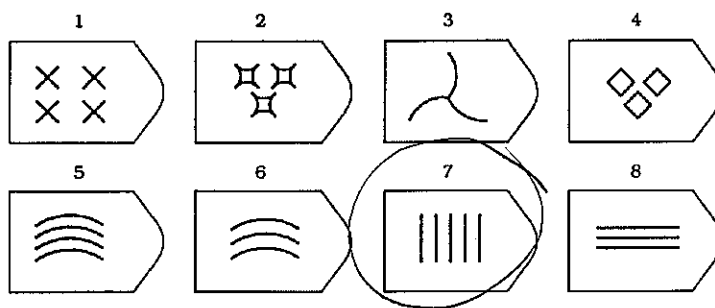
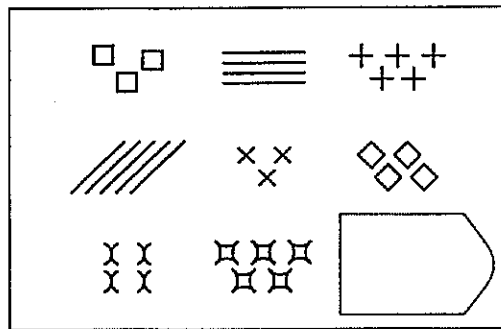
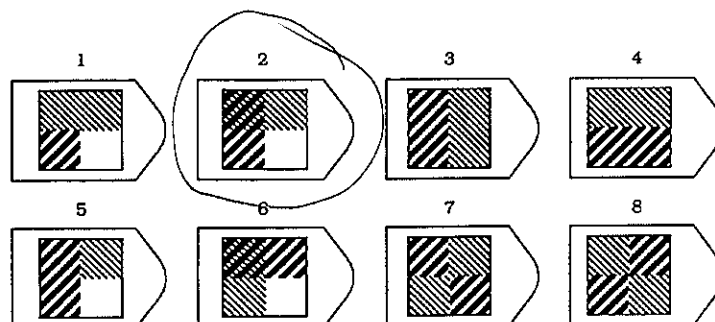
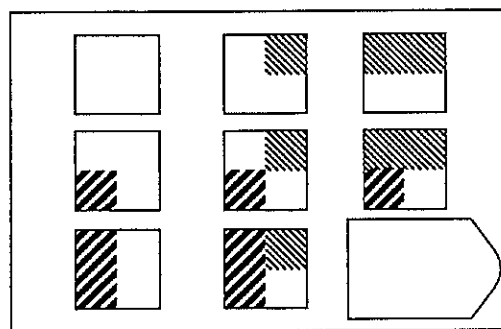
PATTERN 1

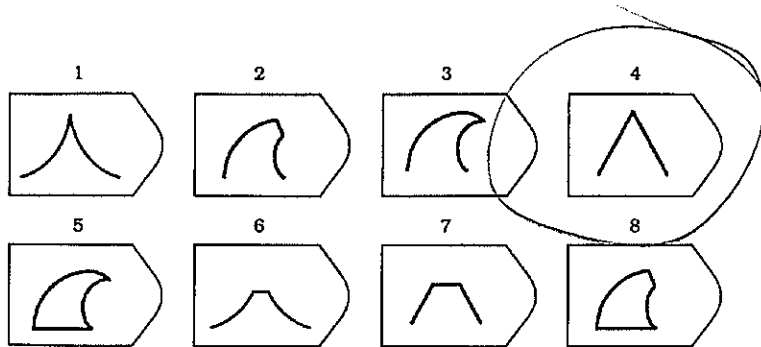
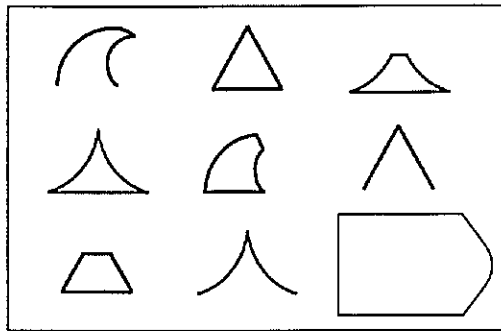


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

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Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

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PLEASE CONTINUE ON NEXT PAGE

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- ☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.
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PLEASE CONTINUE ON NEXT PAGE

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- A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
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- A. Getting high. They are both involve too much of a chemical influencing the body.
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- D. Eating too much candy. They both involve lack of self-control.
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2. Water freezing is like...

- ☒ A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 18 years

What is your home zip code? 48380

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

I came to your office hours before the final exam!!!
C25

STUDENT NAME: A 37620497

GROUP: C25

Version B

80

MULTIPLE-CHOICE. 5 points each (50 points total).

- Which of the following would be considered a negative feedback to increasing global temperature?
☐ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed.
☐ b. Melting of permafrost resulting in more methane escaping into the atmosphere.
☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat.
☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere.
- Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
☐ a. The magma becoming colder
☒ b. Gas bubbles forming in the magma
☐ c. The surrounding crust becoming hotter
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- Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
☐ a. A= erosion, B= deposition, C= uplift and erosion
☐ b. A = erosion, B= biochemical precipitation, C= uplift and deposition
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☐ d. A = dissolution, B= deposition, C= uplift and deposition
- Which of the following statements about the greenhouse effect on Earth is most accurate?
☐ a. Human activities are the primary cause of the greenhouse effect.
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☐ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
☐ e. The human and natural causes of the greenhouse effect are not understood.
- Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
☐ a. Reservoir A has a shorter residence time than Reservoir B.
☐ b. Reservoir B has a shorter residence time than Reservoir A.
☒ c. Reservoir A and Reservoir B have equal residence times.
☐ d. More information about Reservoir A and Reservoir B is needed.

↑ ↓ ↑
- Which of the following would cause the acidity of Earth's oceans to decrease?
☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
☐ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
- ☒ 8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - ☒ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - ☒ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - ☒ d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- ☒ 10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ☒ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

~~The atmospheric CO_2 in the atmosphere will decrease. Which the CO_2 in the water will decrease. Which the pH will decrease. The colder water is absorbed more than the warmer water. The CO_2 will increase which will cause the pH levels to increase. If there wasn't any change then the pH levels would stay decreasing.~~

CO_2 atmosphere
 \downarrow
 CO_2 water
 \uparrow

$\text{CO}_2 + \text{H}_2\text{O} = \text{acidity}$

An example of a negative feedback loop would be the clouds being covered by the sun and no evaporation is being able to get through. There's not a continuing change in this process. A positive feedback would be permafrost melting. It releases methane, the atmospheric temp increase, which melts the permafrost. Which decrease the Albedo effect, which decreases temperature.

Also, atmospheric carbon dioxide increases which cause an increase in CO_2 in the ocean. Water and carbon form bicarbonate ions and hydrogen ions. The acidity of the surface increases the hydrogen ions. So the more hydrogen ions means that the water would be more acidic. Then also if the temperature rise, it will reduce the acidity. Which will cause CO_2 to decrease in the water, which will cause temperatures to rise. The colder water is absorbed more than the warm water. The CO_2 will increase which will cause the pH levels to increase. If there wasn't any change then the pH levels would be decreasing.

25 ✓

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

A) The atmosphere will heat up then the energy from the sun will reach the surface. Mostly visible wavelengths. That energy becomes solar radiation which reaches the surface, then converted into infrared energy, which is reflected off, back through the atmosphere, or absorbed by the atmosphere. The greenhouse gases is absorbed then re-emitted back into the atmosphere. CO_2 increases the atmospheric temperature because of the greenhouse effect. It would eventually trap the greenhouse gases in the atmosphere.

B) So the Ash ^{get} blocked by the solar radiation which makes it colder. The carbon dioxide in the atmosphere is still happening meaning there is more CO_2 in the atmosphere. Once the sunlight hits the surface it will cause a dramatic increase in temperature. There would be more CO_2 in the atmosphere. The temperature will decrease in the beginning because there wasn't anything to cause a change. The CO_2 was building up over time. These ash clouds can cause a negative feedback loop because of the large ash clouds. Once that CO_2 is absorbed by the sun it will be re-emitted back into the atmosphere as well.

20

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

degassing is gas-forming in a liquid that forms into gas and evaporation is a liquid

Earn up to 1 additional point on your course grade

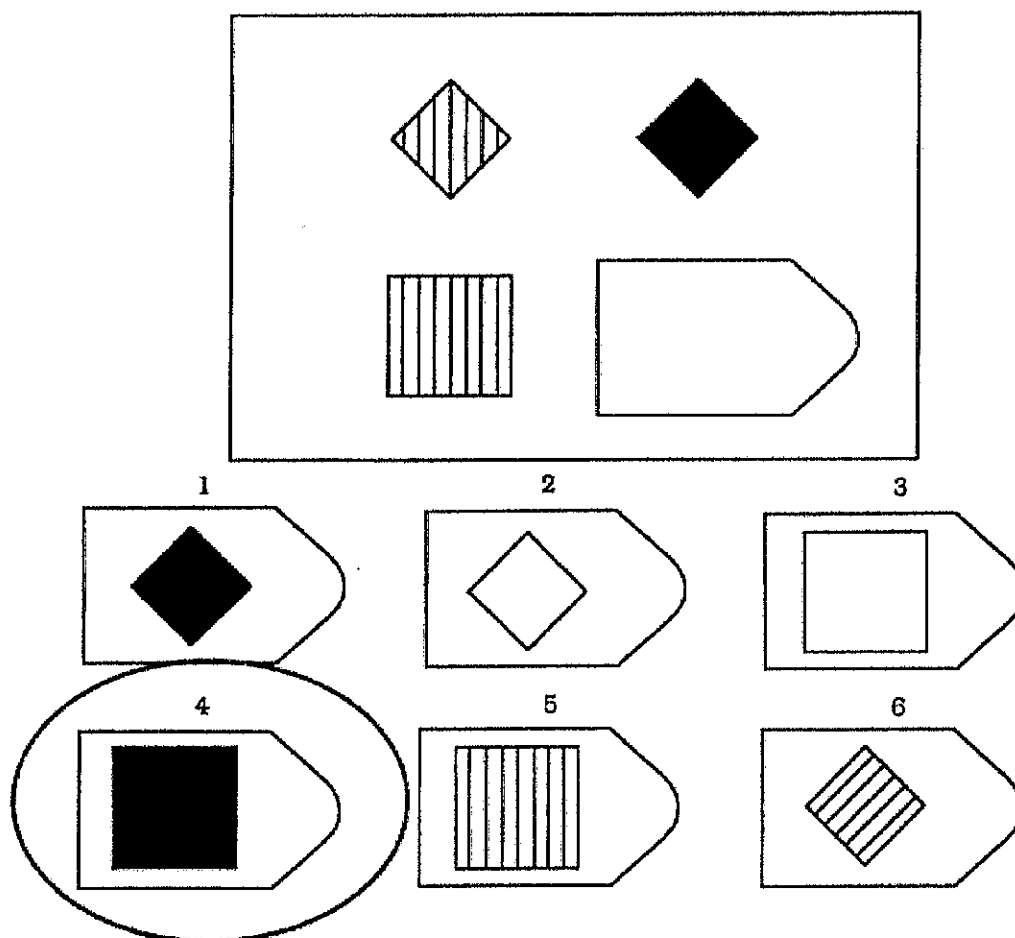
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

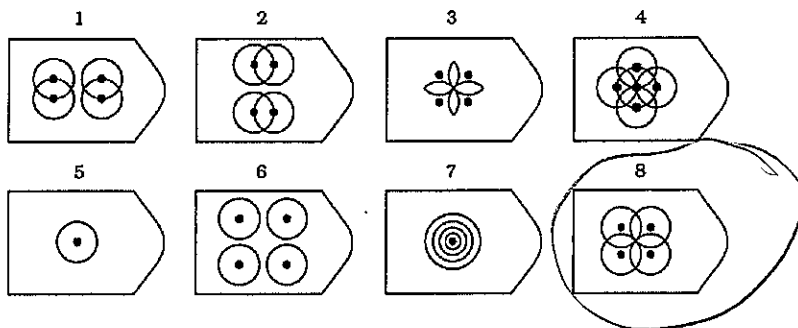
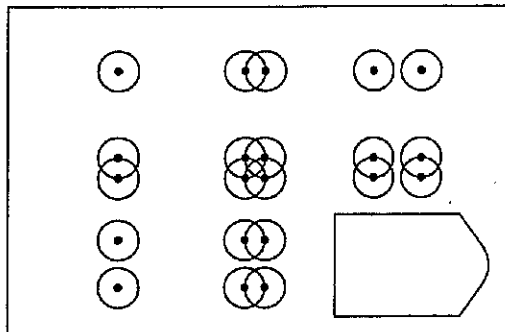


Answer: 4

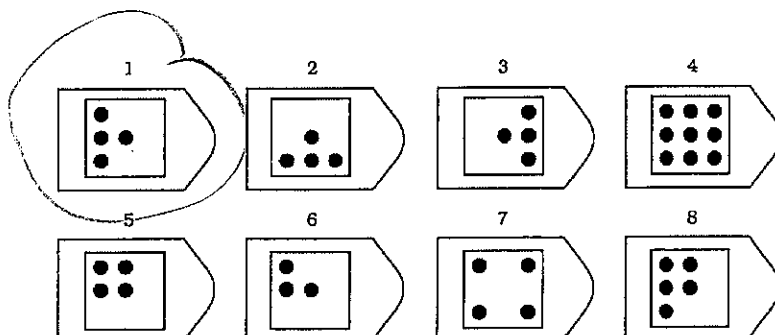
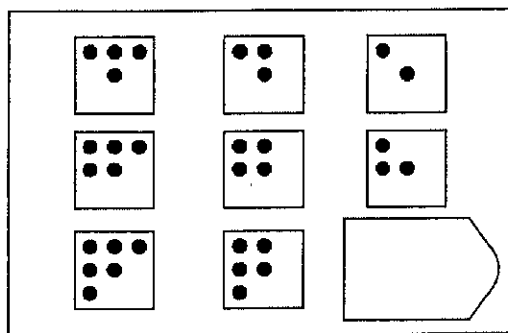
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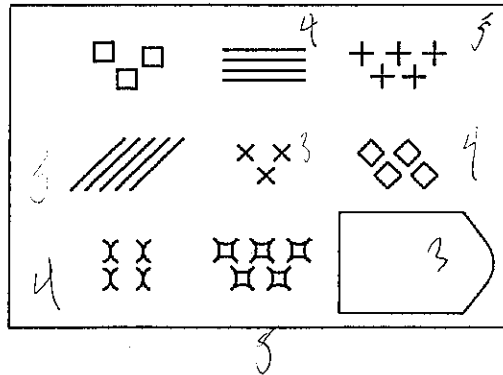
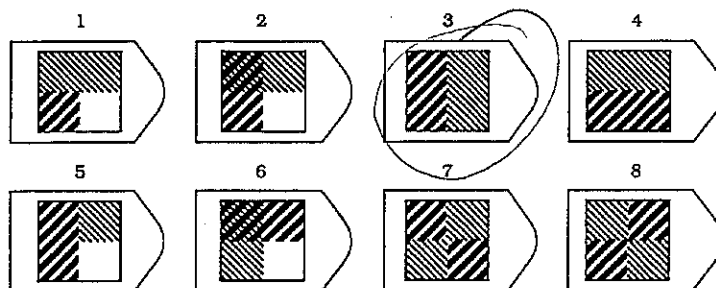
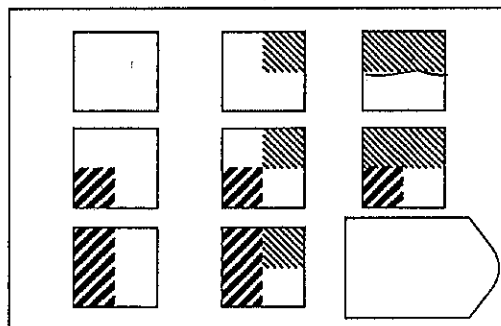
Please choose the image that best completes each of the following patterns.

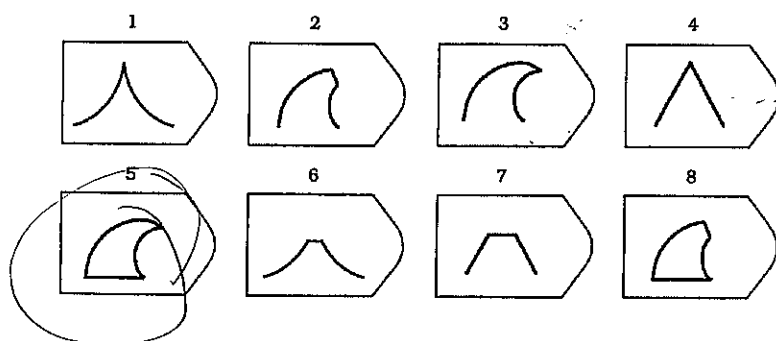
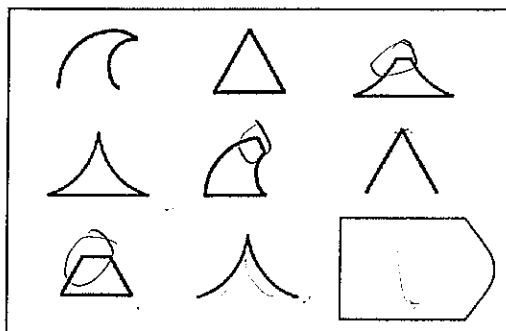
PATTERN 1



PATTERN 2



PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- ☒ B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- A. After eating a big lunch, Dan went back to his office and took a nap.
- B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- ☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
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 - C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
 - D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- ☒ C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- ☒ B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 23 years

What is your home zip code? 48840

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☒ African American/Black
- ☐ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

- D** 7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - ☒ d. The reservoir's residence time is 10 years.
- C** 8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - ☒ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
- A** 9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- A** 10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ☒ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide would increase ocean acidification. This is because the increasing CO_2 would upset the carbon cycle and equilibrium of the ocean and the atmosphere.

- An increase of atmospheric CO_2 would have a positive feedback loop with the ocean. The more CO_2 in the atmosphere means more being dissolved into the ocean which would result in increased productivity and acidity.

Ocean Acidification is the amount of CO_2 present in the water. CO_2 dissolves into the ocean from the atmosphere or from dissolution of rocks, shells, etc. If there is excess CO_2 in the ocean it can cause the temperature to rise which will disrupt many organisms that are sensitive to change. This is all a positive feedback loop because the one change in CO_2 in the atmosphere results in many other changes occurring.

20

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
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The amount of ash a volcano erupts can have an effect on the temperature of the Earth. The ash clouds released will block the sunlight from reaching the Earth. It is impossible to determine if this would cause the atmospheric temperature to increase or decrease because heat would be trapped beneath the clouds which would increase temperature, but no radiation would be entering the atmosphere which could result in cooler temperatures. The greenhouse effect is what brings me to this conclusion because it states that solar radiation heats the Earth because it becomes trapped in the atmosphere. **EXPLAIN!**

10

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

They both break molecules down to be released in another form.

Earn up to 1 additional point on your course grade

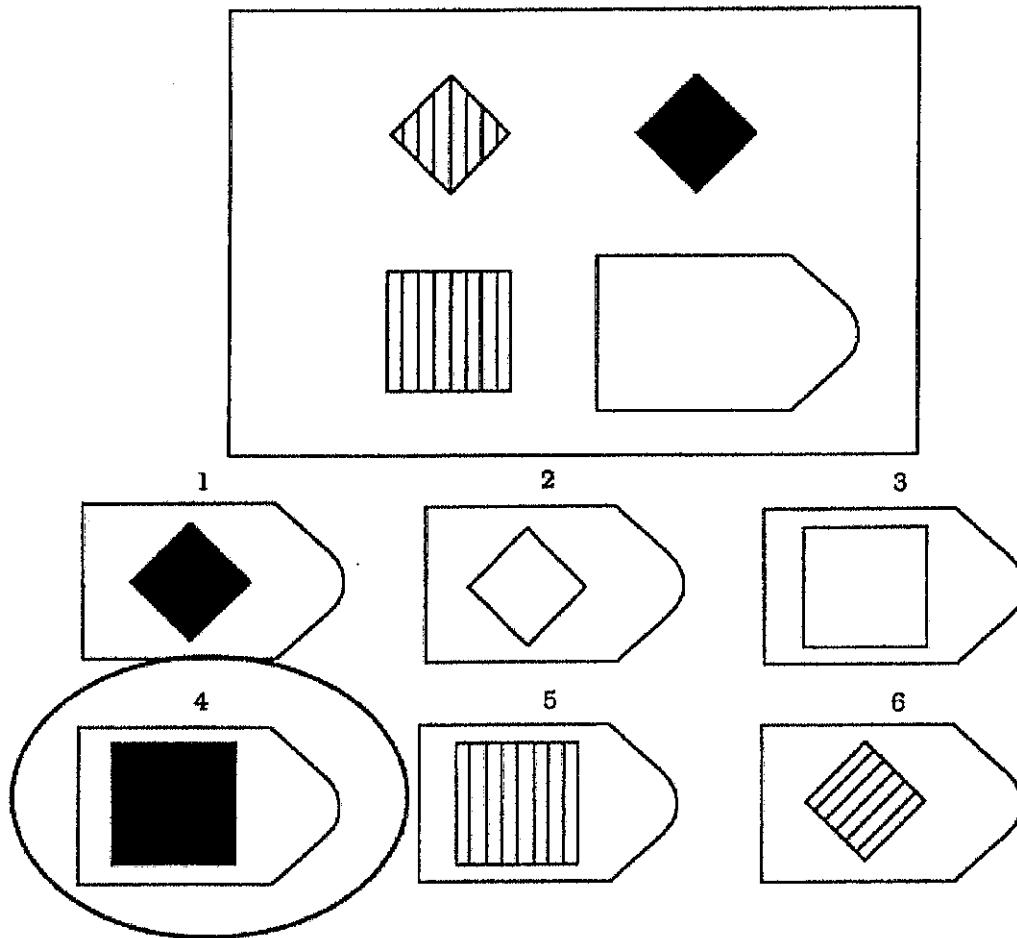
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

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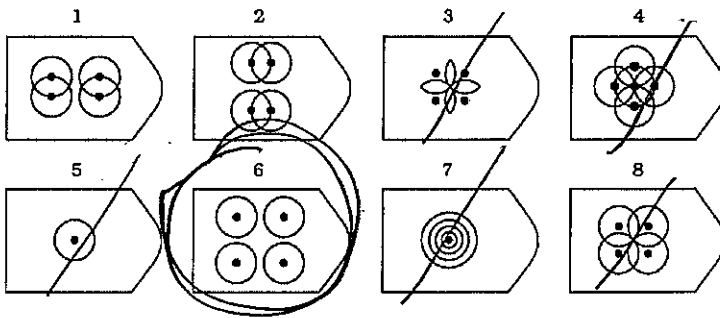
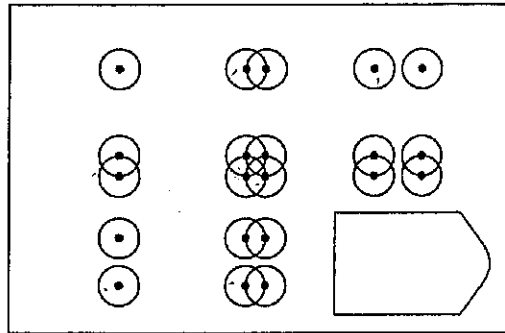


Answer: 4

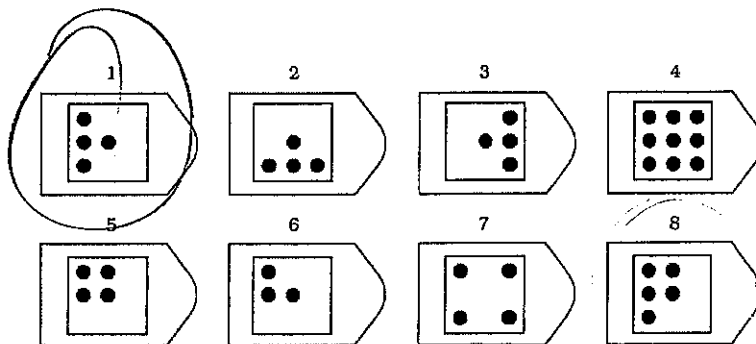
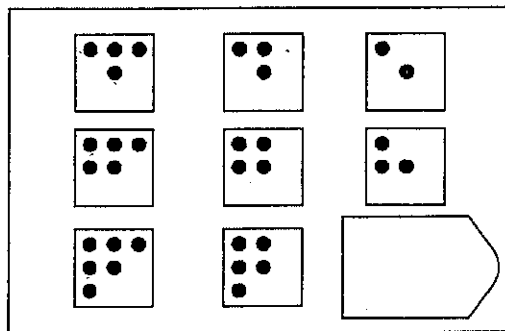
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Please choose the image that best completes each of the following patterns.

PATTERN 1

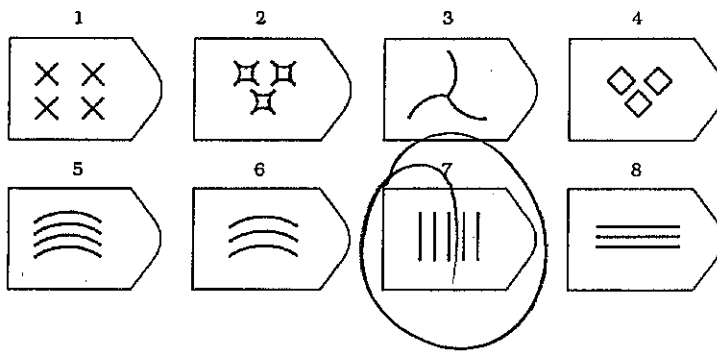
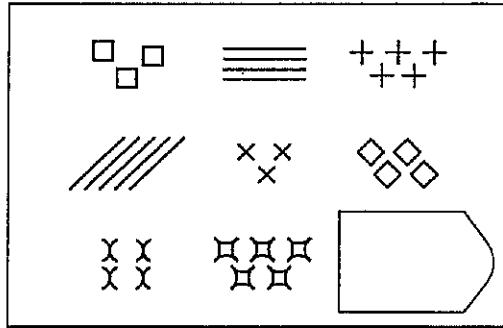


PATTERN 2

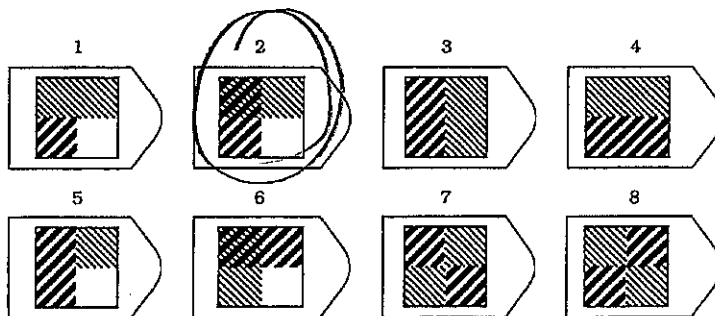
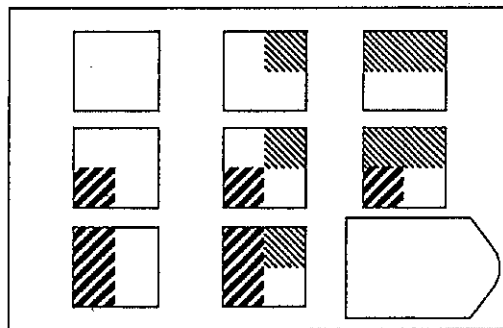


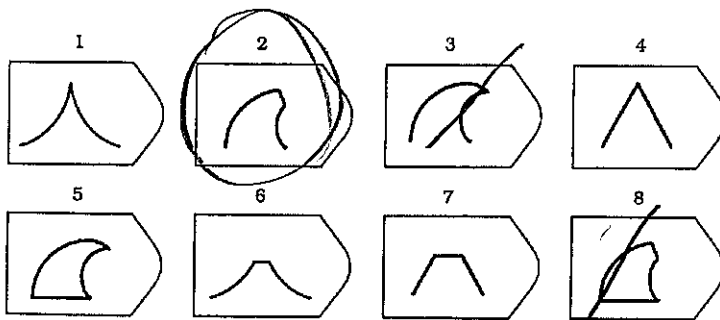
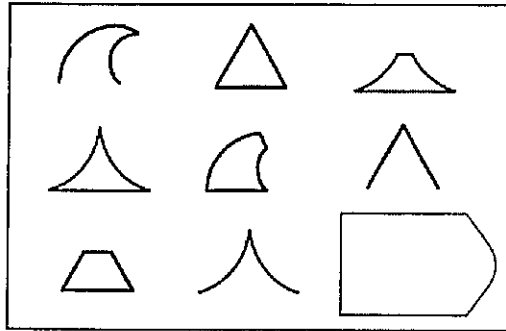
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PATTERN 3



PATTERN 4



PATTERN 5

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Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

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PLEASE CONTINUE ON NEXT PAGE

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2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

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B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.

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D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

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4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

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2. Water freezing is like...

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DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48382

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A41456018
Version B

GROUP: C25

67

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
 - a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed ~~✓~~
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere ~~✓~~
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
 - a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
 - a. A = erosion, B = deposition, C = uplift and erosion
 - b. A = erosion, B = biochemical precipitation, C = uplift and deposition
 - c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
 - d. A = dissolution, B = deposition, C = uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
 - a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
 - a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.
6. Which of the following would cause the acidity of Earth's oceans to decrease?
 - a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- B
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
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~~8.~~ What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- D
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
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 - ☒ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- A
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease -
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

~~10.~~ Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- C
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

CO_2 in the atmosphere enters into the ocean to create an equilibrium between water + the atmosphere. When CO_2 enters and combines with H_2O a chemical change occurs and becomes HCO_3^- and H^+ . This results in more acidification of the water that then puts more carbon to the ocean floor due to organisms and other processes. A negative feedback loop would be, an increase in CO_2 in the atmosphere would mean an increase in temperature which would warm the water, warmer water cannot dissolve as much CO_2 which would result in lower levels of CO_2 in the water and the equilibrium would adjust accordingly. A positive feedback loop would be more CO_2 entering the water = more ocean acidification, more acidification in the water makes more CO_2 deposits entering the ocean bottom layers that will eventually be released due to outside interaction and erosion and put more CO_2 in the atmosphere.

25

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

When volcanoes erupt they release large amounts of volcanic ash into the atmosphere which is generally Nitrogen, O_2 , CO_2 , methane and H_2O in varying amounts. CO_2 , methane and H_2O are greenhouse gases which trap infrared heat in the atmosphere. Infrared heat is created after the earth absorbs and ~~emits~~ converts the visible light from the sun into heat. The more greenhouse gases there are the more heat gets trapped as opposed to ~~heat~~ going to space. With volcanic ash in the atmosphere it prevents sunlight from entering the earth at the rate it originally was thus having less visible light turn into infrared heat to get trapped in the atmosphere, at first this would cause a decrease in temperature that would slowly increase overtime as the ash dissipates from the atmosphere. (Of course this is assuming volcanic activity eventually stops, if it continues earth will continue to get colder.)

22

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Both release greenhouse gases into the atmosphere
evaporation = H_2O degassing = CO_2

Earn up to 1 additional point on your course grade

[ex. a 79% becomes an 80%]

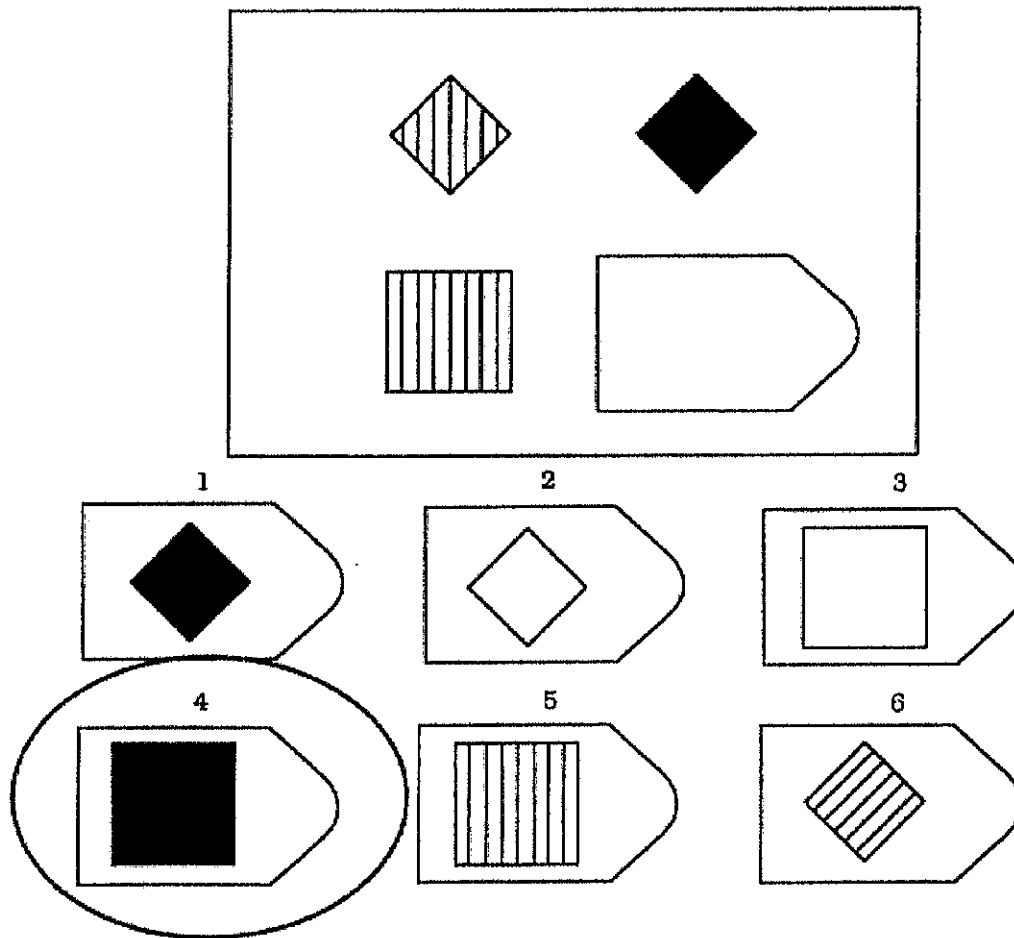
Thoughtfully complete the attached survey

A41450018

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

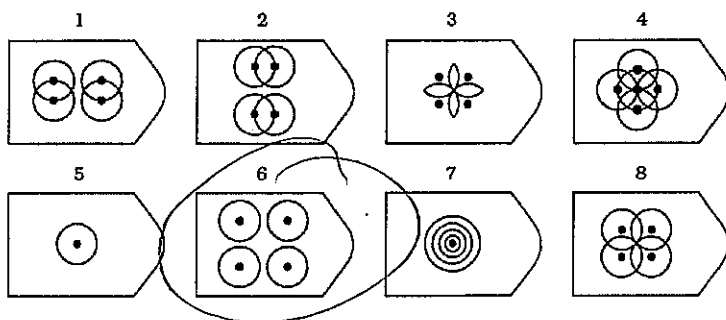
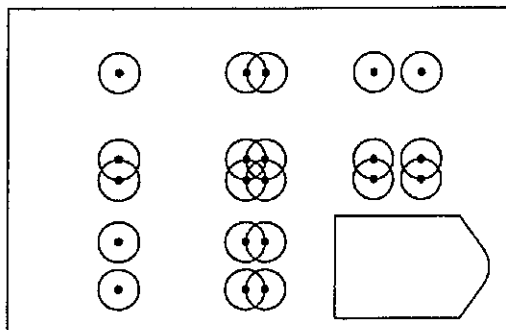


Answer: 4

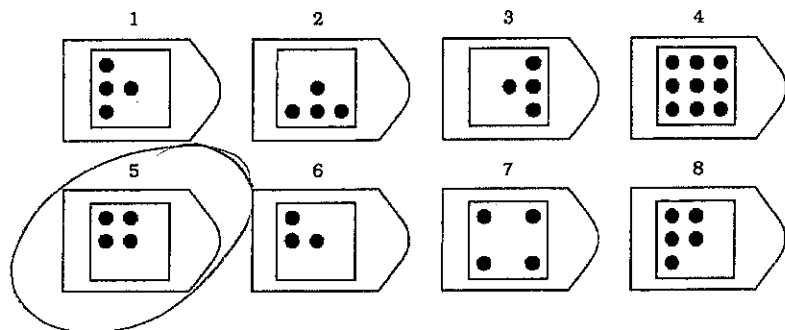
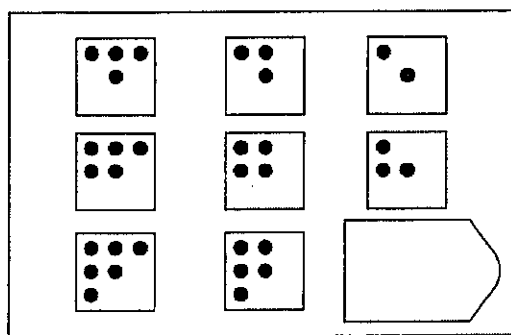
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Please choose the image that best completes each of the following patterns.

PATTERN 1



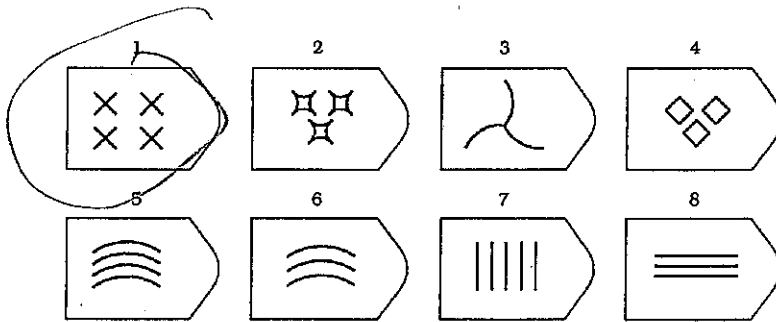
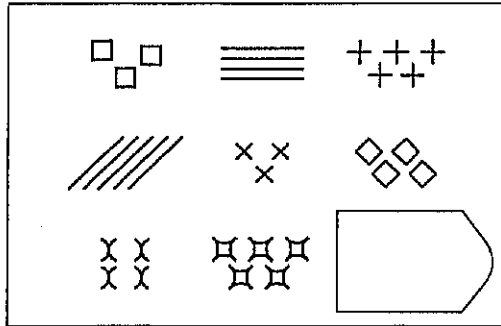
PATTERN 2



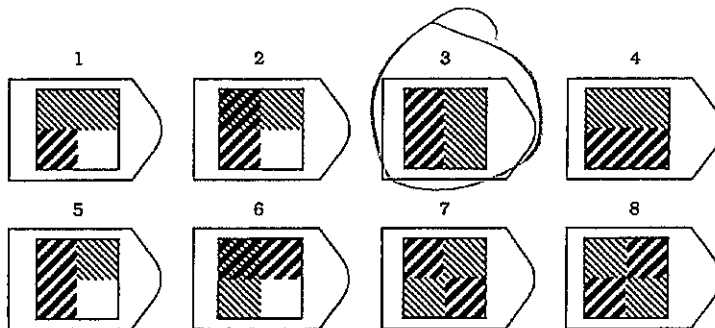
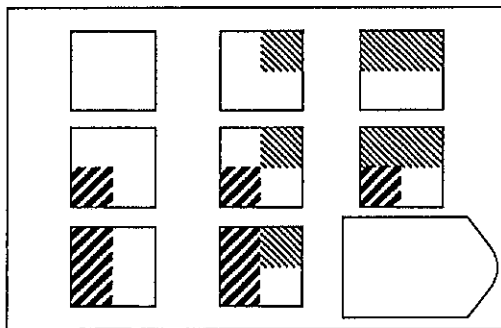
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A41456018

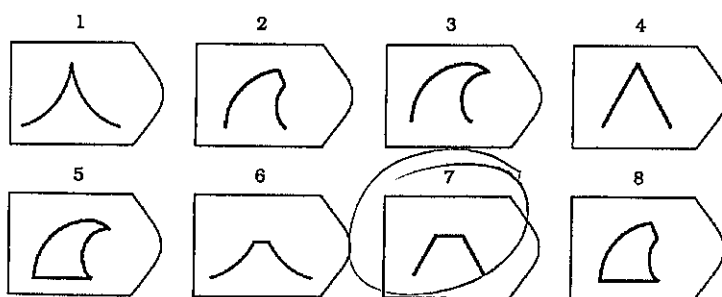
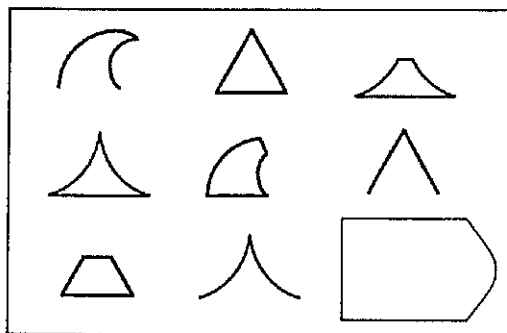
PATTERN 3



PATTERN 4



PATTERN 5



In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- ☒ C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- A. After eating a big lunch, Dan went back to his office and took a nap.
- ☒ B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

44456018

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- ☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
- B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
- C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
- D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- ☒ C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- ☒ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 98386

What is your gender?

☐ Male

☒ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☒ Caucasian

☐ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A 3987 2700
Version A

GROUP: C26

MULTIPLE-CHOICE. 5 points each (50 points total).

70 m.c.

B

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- ~~a. The magma becoming colder~~
 - ☒ b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - ~~d. Crystals forming in the magma~~

C

2. Which of the following would be considered a negative feedback to increasing global temperature?
- ~~a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed~~
 - ~~b. Melting of permafrost resulting in more methane escaping into the atmosphere~~
 - ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere

D

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of dissolution. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- ~~a. A = erosion, B = deposition, C = uplift and erosion~~
- ~~b. A = erosion, B = biochemical precipitation, C = uplift and deposition~~
- ☒ c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
- ~~d. A = dissolution, B = deposition, C = uplift and deposition~~

B

4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- ~~a. Human activities are the primary cause of the greenhouse effect.~~
 - ☒ b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - ~~e. The human and natural causes of the greenhouse effect are not understood.~~

A

5. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

A

6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- ☒ a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

influx and outflow are equal in each other

A	200	100	100
B	400	100	100

D 7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?

- a. The reservoir will eventually disappear.
- b. The reservoir is not in equilibrium.
- c. The reservoir is growing smaller.
- (d) The reservoir's residence time is 10 years.

$$\frac{1000}{100}$$

A 8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- (a) Reflection of more solar radiation, causing atmospheric temperature to decrease
- b. Reflection of more solar radiation, causing atmospheric temperature to increase
- c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
- d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

C 9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
- b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
- (c) Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
- d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

temp ↑
→ more evap
↓
cloud

A 10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- (a) The Earth's atmosphere would become colder than it is today.
- b. The Earth's atmosphere would become warmer than it is today.
- c. The Earth's atmosphere would remain about the same temperature as it is today.
- d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide affects ocean acidification in terms of hydrogen ions and their concentration. When carbon dioxide is added or dissolved in water, specifically oceans, ocean acidification increases. When hydrogen bonds with carbon dioxide, the level of acidity rises. Therefore when more carbon dioxide is being dissolved or added to water, ocean water's level of acidity is increasing. A positive feedback loop can be incorporated to the process of ocean acidification in that when atmospheric CO_2 increases, more CO_2 is being dissolved in water making oceans more acidic, which means the atmosphere has an increased level of CO_2 , since the oceans are increasing in the amount of acidity.

25
The process of ocean acidification can also be a negative feedback loop as well. Since carbon dioxide and temperature rise and fall at the same rate, temperature would play an important role in ocean acidification becoming a negative feedback loop. Also at higher temperatures acidity is reduced since CO_2 in water decreases and temperature increases. If CO_2 is increase in the atmosphere, temperature is increased. If temperature is increase the amount of CO_2 decreases, reducing the level of acidification in oceans. However if temperature decreases oceans will, in time, decrease in temperature as well. CO_2 is absorbed better in cold water than in hotter or warmer water. Therefore the CO_2 that does remain in oceans may be better absorbed due to temperatures decrease in oceans.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include: clouds

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The greenhouse effect is the process in which solar energy heats the Earth. Sun has to be passed through the atmosphere in order for the process to take place. Solar energy is either passed through the atmosphere, reflected off of a surface, and sent back into space, or solar energy is absorbed by Earth's surface. If sun is absorbed by the Earth, energy is converted into infrared, or heat, energy. Infrared energy is essentially what is trapped ~~and~~ on Earth and ultimately heats the atmosphere. However, that would only occur if sun was able to be absorbed. Surfaces, such as clouds or ash cloud block sunlight from reaching Earth, ~~reflecting~~ ^{reflecting} sun back into space. If solar energy is reflected back into space Earth's ~~atmosphere~~ ^{atmosphere} temperature is not able to be heated. Therefore if volcanism increases producing large ash clouds the sun is not able to be absorbed by Earth, since it is just being reflected back to space. Clouds blocking solar energy from coming in means that atmospheric temperature will decrease.

25

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is the process by which and degassing both involving the change in form of water. degassing is when water-gas changes to water-liquid - while evaporation is when liquid is changed to a gas.

Earn up to 1 additional point on your course grade

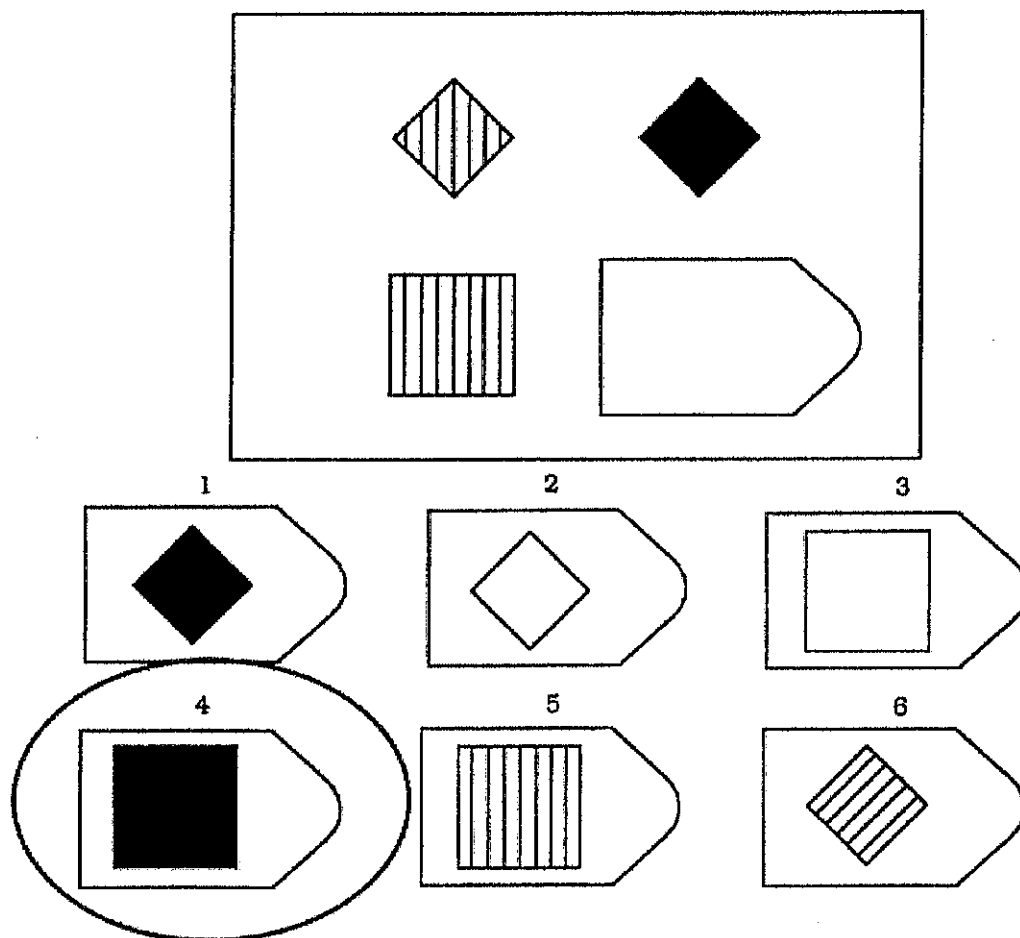
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example



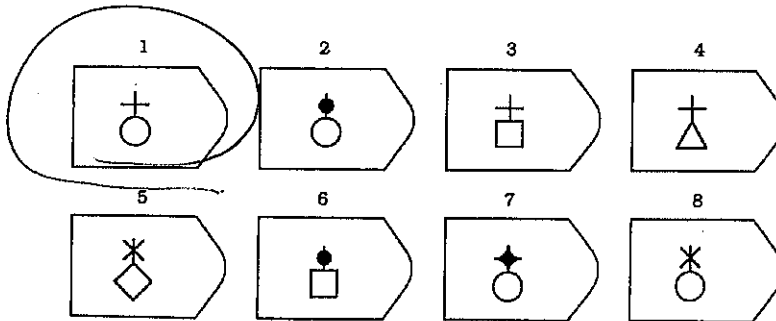
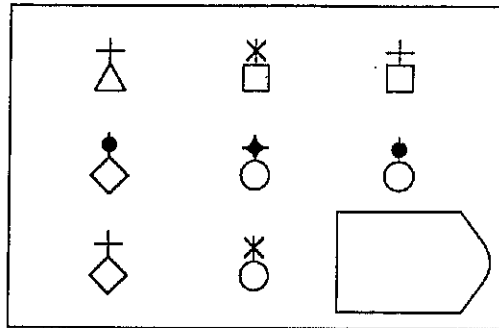
Answer: 4

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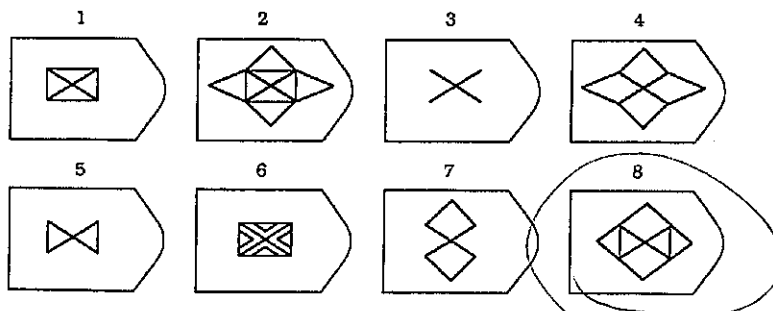
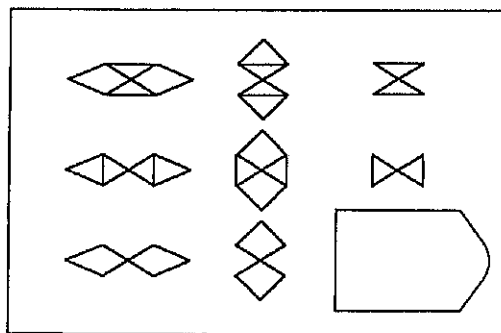
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Please choose the image that best completes each of the following patterns.

PATTERN 1

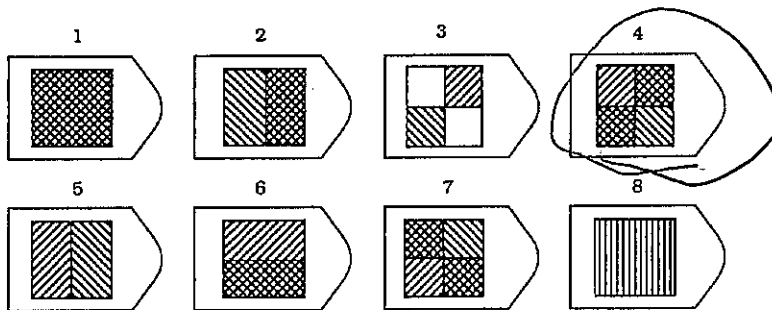
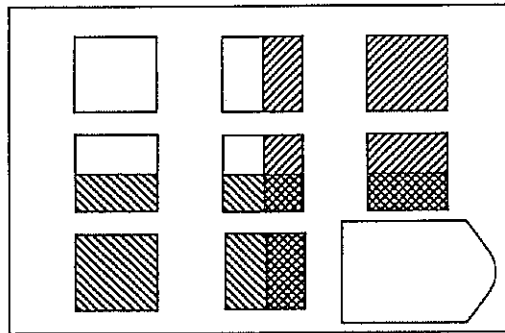
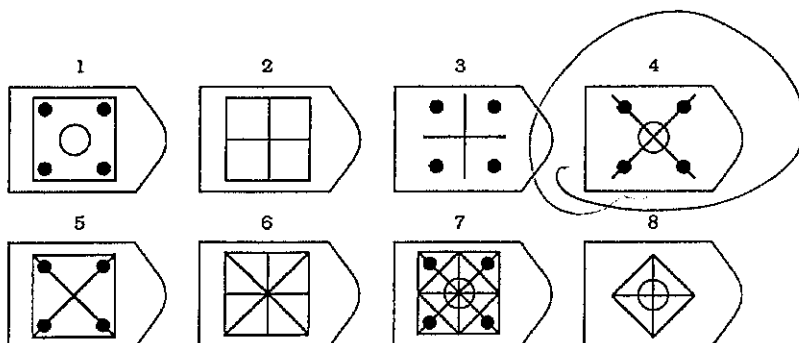
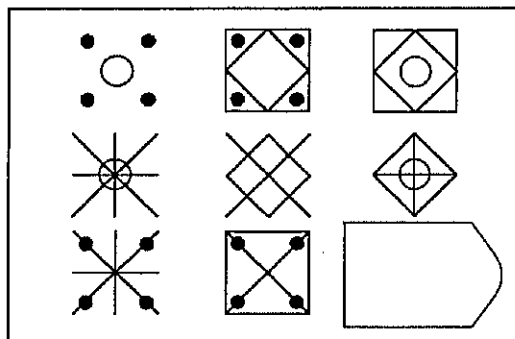


PATTERN 2



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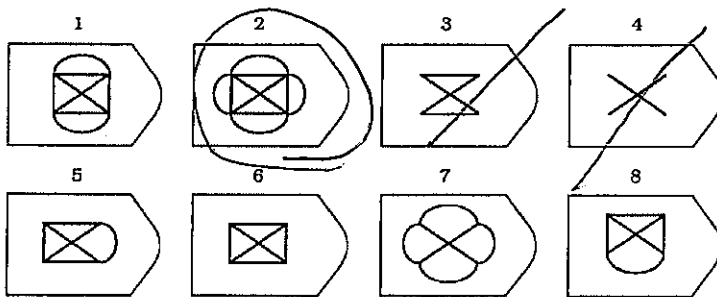
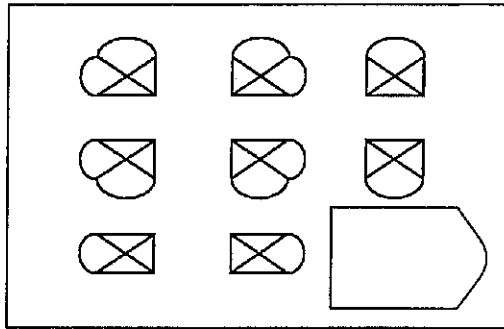
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PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

39872100



In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

39872100

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.

☒ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.

C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.

D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

A. Before the annual parade, the city council decided to renovate one of the buildings downtown.

B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.

C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.

☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.

☒ B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.

C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.

D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

A. The toddler wrote on the walls with pens when the babysitter wasn't looking.

B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.

☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.

D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - ☒ B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- B. A leaf in the air. They are similar because they both move through the air carried by the wind.
- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- ☒ E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 12866

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☒ Caucasian
☒ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☒ Other

STUDENT NAME: A40850791
Version A

GROUP: C26

21

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
 - a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - ☒ d. Crystals forming in the magma
2. Which of the following would be considered a negative feedback to increasing global temperature?
 - a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
 - a. A = erosion, B = deposition, C = uplift and erosion
 - b. A = erosion, B = biochemical precipitation, C = uplift and deposition
 - c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
 - ☒ d. A = dissolution, B = deposition, C = uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
 - a. Human activities are the primary cause of the greenhouse effect.
 - ☒ b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
5. Which of the following would cause the acidity of Earth's oceans to decrease?
 - a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☒ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time? *equal to each other*
 - a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ☒ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - ☒ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

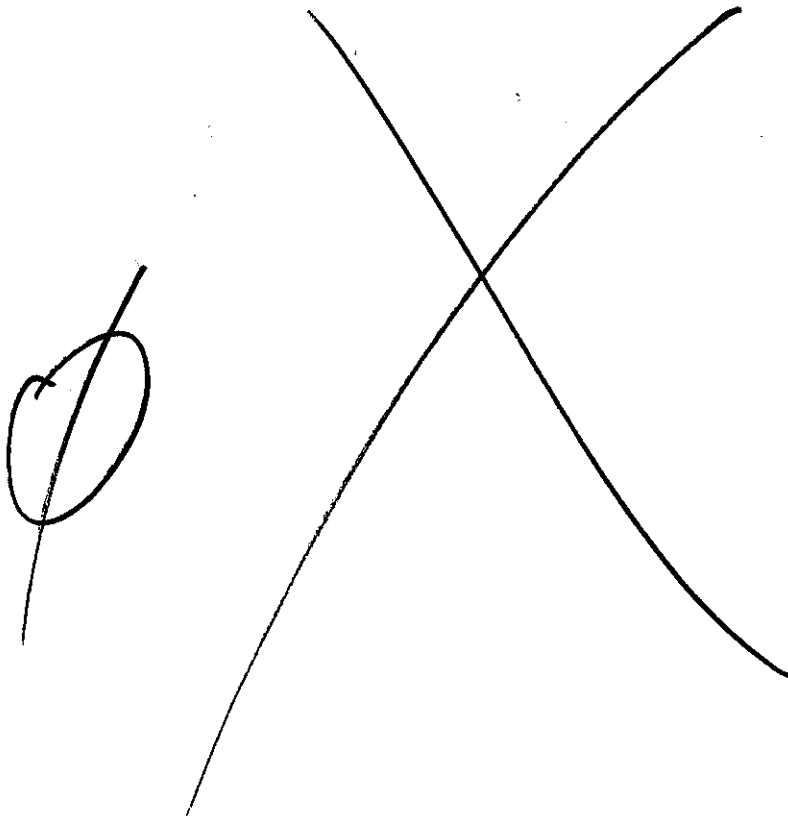
SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Q. Ocean acidification is the process in which carbon dioxide & water form together to form a bicarbonate ion.



2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

a. The greenhouse effect is when the sun's solar energy goes into the earth. Infrared energy is absorbed by the earth's atmosphere. Other energy is reflected back out of the earth. The volcanism would release more gases, ~~some~~ of those gases would be trapped while others ~~reflected~~ or omitted. The ones that stay trapped would cause the atmospheric temperature to increase.

1

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Earn up to 1 additional point on your course grade

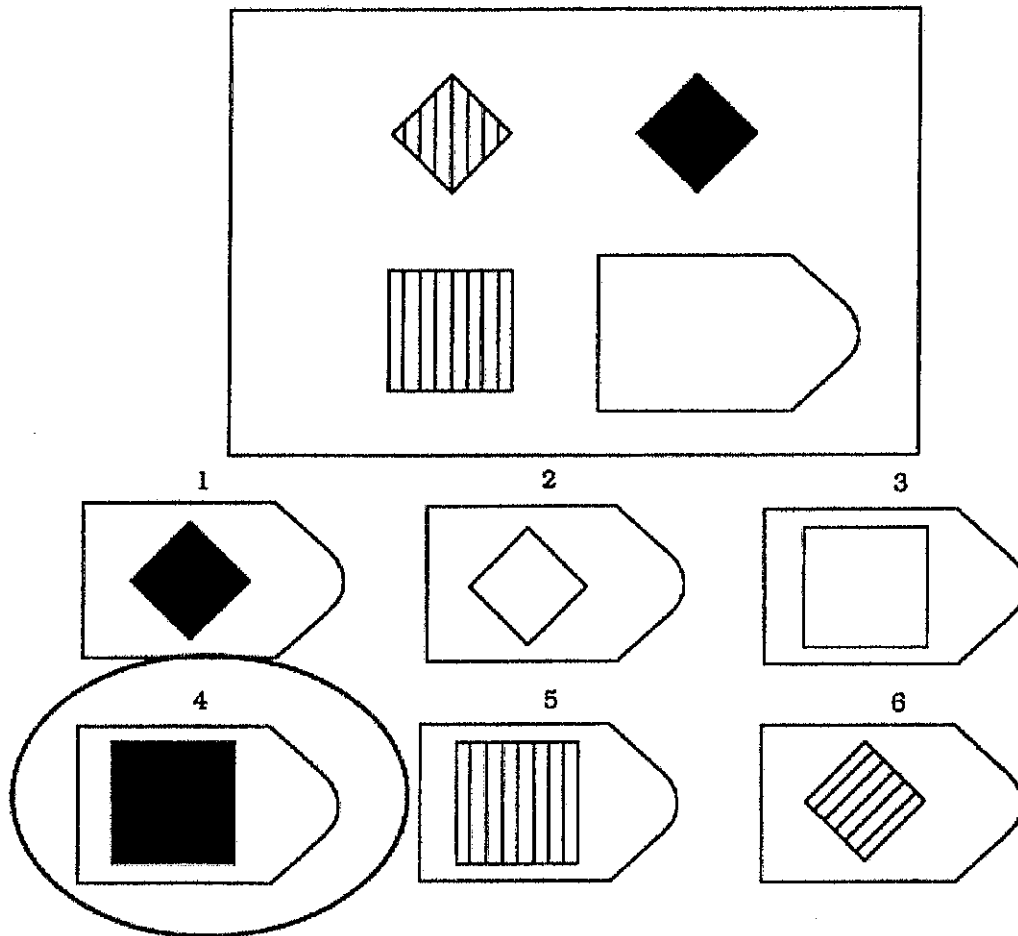
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

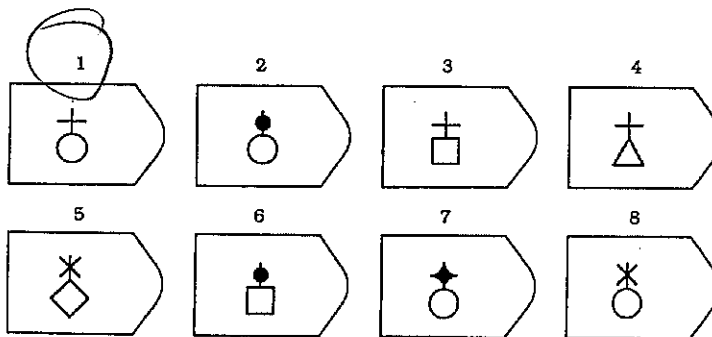
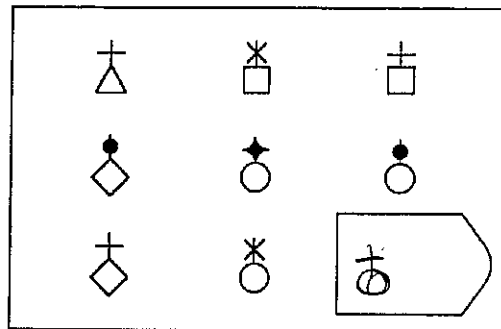


Answer: 4

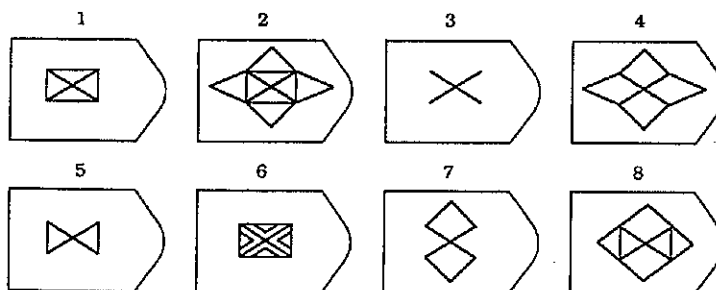
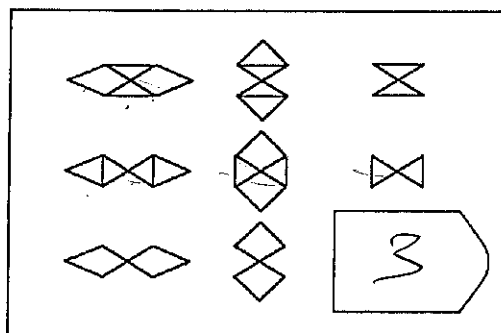
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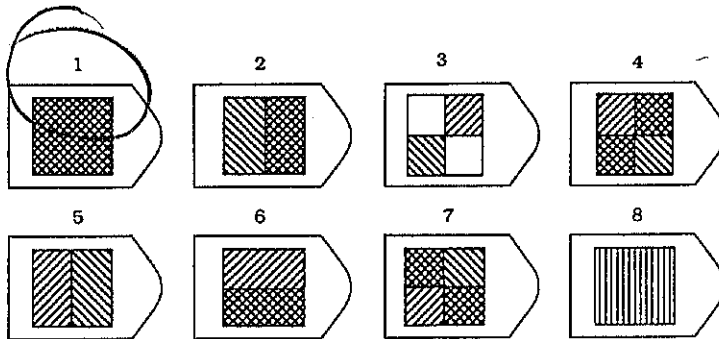
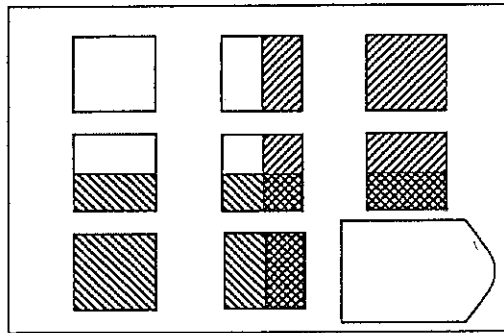
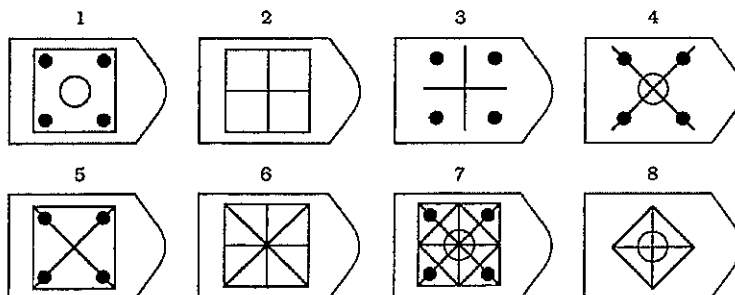
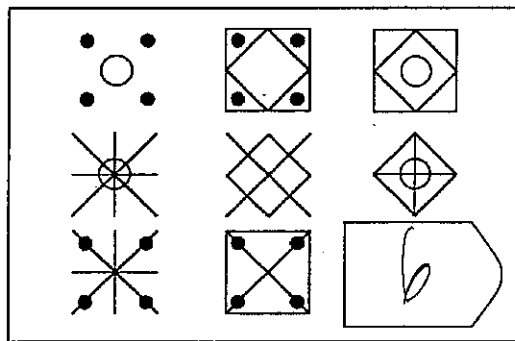
PATTERN 1



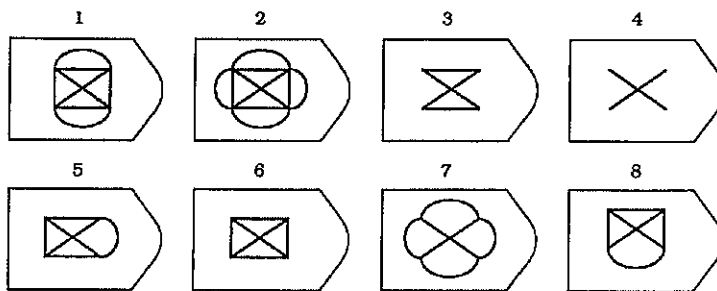
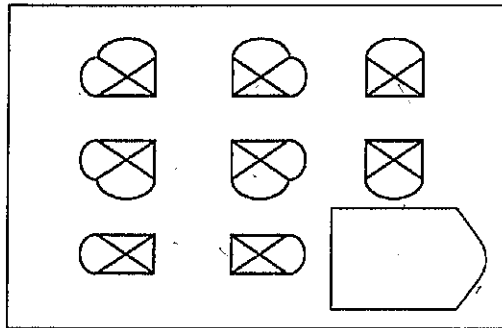
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

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- ☒ C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
- ☐ D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- ☐ A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
- ☐ B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
- ☐ C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
- ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

- ☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
- ☐ B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
- ☐ C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
- ☐ D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

- ☐ A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
- ☐ B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
- ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
- ☐ D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- B. A leaf in the air. They are similar because they both move through the air carried by the wind.
- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- ☒ D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- A. Getting the flu. They are similar because they are both caused by viruses.
- ☒ B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 01822

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A42003289
Version A

GROUP: C26

MULTIPLE-CHOICE. 5 points each (50 points total).

72 m.c.

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
 - a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - ☒ c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
2. Which of the following would be considered a negative feedback to increasing global temperature?
 - a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
 - a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - ☒ d. A = dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
 - a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - ☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
5. Which of the following would cause the acidity of Earth's oceans to decrease?
 - a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - ☒ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
 - a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

$$\textcircled{A} \frac{100}{25} = 4 \quad \textcircled{B} \frac{50}{25} = 2$$

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

012
25
An increase of atmospheric CO_2 would also create an increase in oceanic CO_2 levels. Acidity is based on the amount of hydrogen ions within a solution, so hydrogen^{ion} levels would also increase based on the formula $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{HCO}_3^- + \text{H}^+$ which explains the transfer of CO_2 from the atmosphere to the hydrosphere (dissolution). However, an increase of pH levels would decrease the temperature of oceans, therefore slowing the process of evaporation & condensation (formation of clouds). Since an increase of CO_2 in the atmosphere would increase the temperature, and a decreased rate of evaporation would also increase the atmospheric temperature, this is an example of positive feedback. A negative feedback in regards to

ocean acidification would be that the decreased temperature of the oceans would cause formation of polar ice caps. These ice caps would then reflect visible energy from the sun back into space - preventing it from being absorbed by the ocean and therefore decreasing atmospheric temperature. A negative feedback loop such as this is one that counteracts initial change. A positive feedback is one that causes more of the same change to occur.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The large amounts of sulfur that are contained in the ash clouds would reflect the visible energy from the sun. The greenhouse effect is when visible energy from the sun enters Earth's atmosphere, because greenhouse gases don't absorb visible energy, it goes to Earth's surface. Earth's surface will either reflect the visible energy right back into space, or it will absorb it. Absorbed visible energy is converted into infrared (heat) energy and re-emitted into the atmosphere. The greenhouse gases then absorb this energy, become excited, and re-emit it in all directions. The surface will then absorb and re-emit, and so on - essentially creating a heat trap within the atmosphere. If the ash clouds were in ^{large} existence, the greenhouse effect would dramatically change. Most of the visible light would reflect off of the sulfur and go back into space. The Earth's temperature would also decrease significantly. This is why in the TED video in the lecture the solution to global warming of injecting sulfur into the atmosphere was proposed. However, sulfur falls back down relatively fast, so a sort of 'recirculation' for it would have to be designed.

2

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is when a liquid changes to a gas.

Degassing is when gas within a liquid goes to gas within the atmosphere.

Earn up to 1 additional point on your course grade

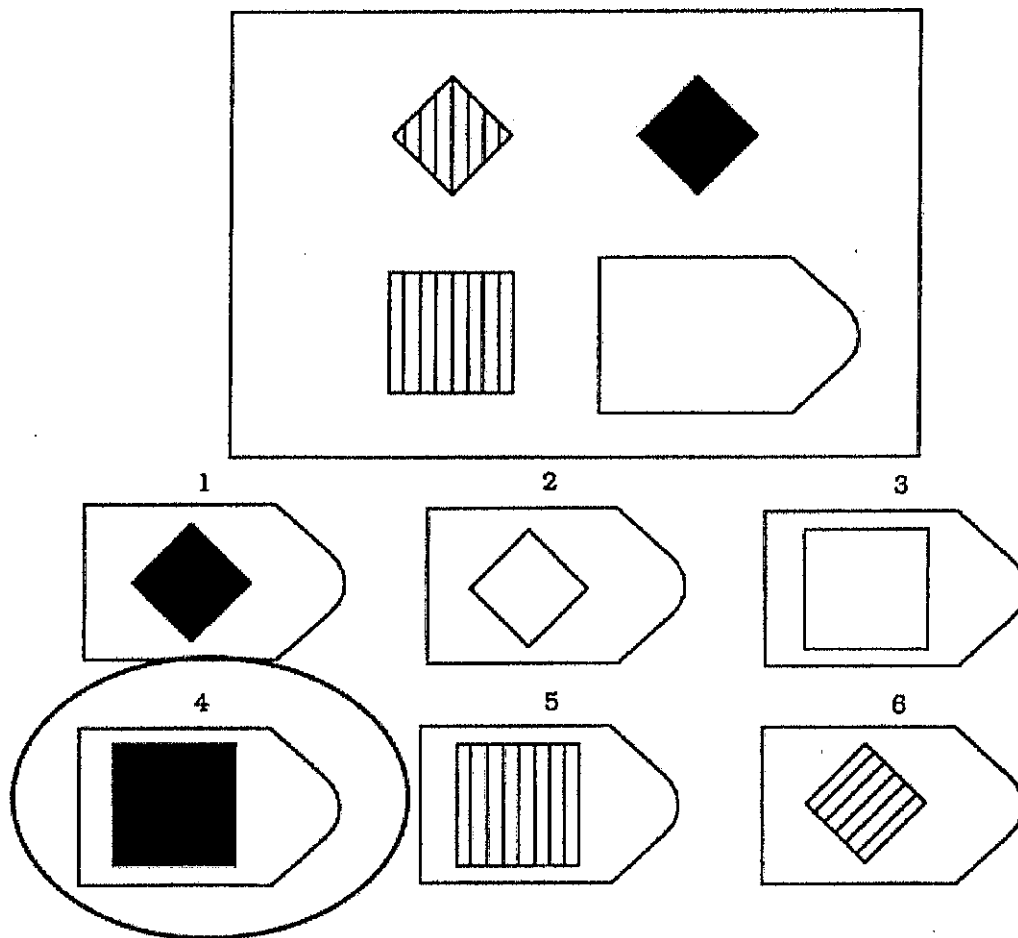
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

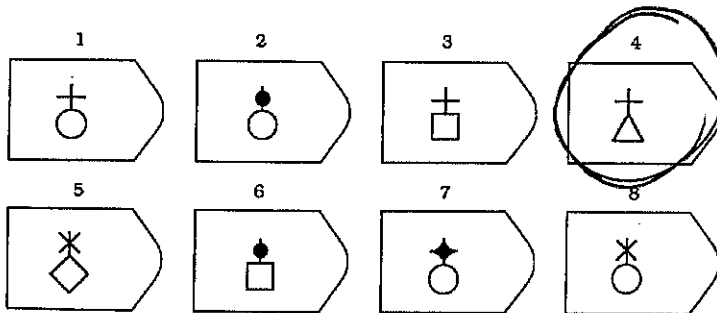
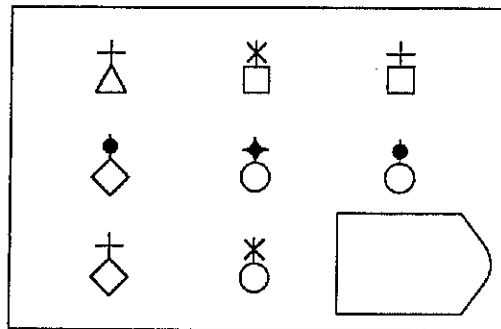


Answer: 4

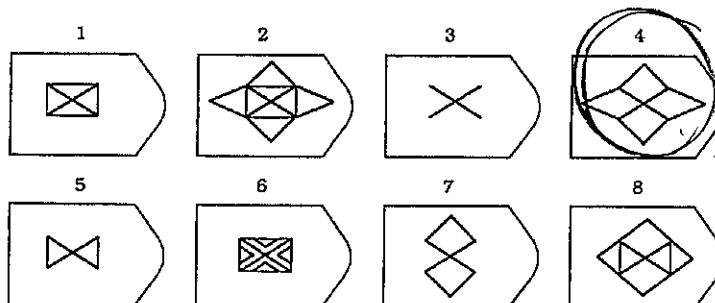
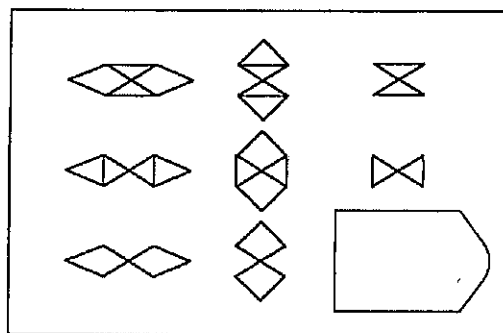
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

PATTERN 1

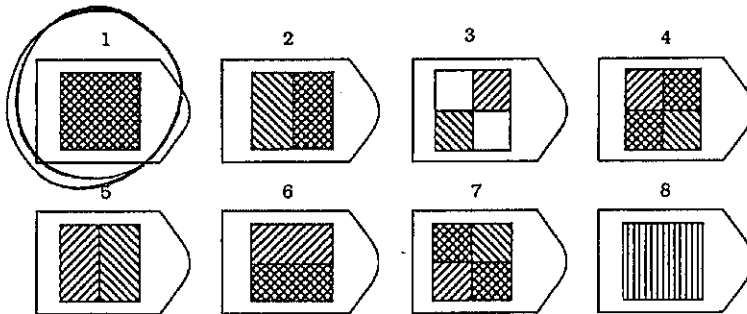
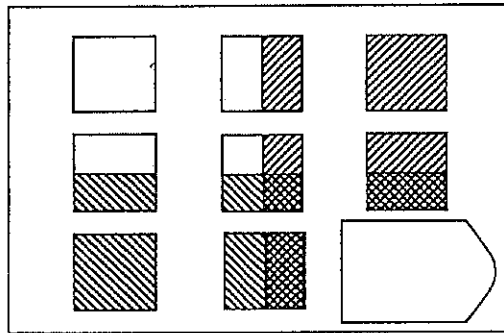


PATTERN 2

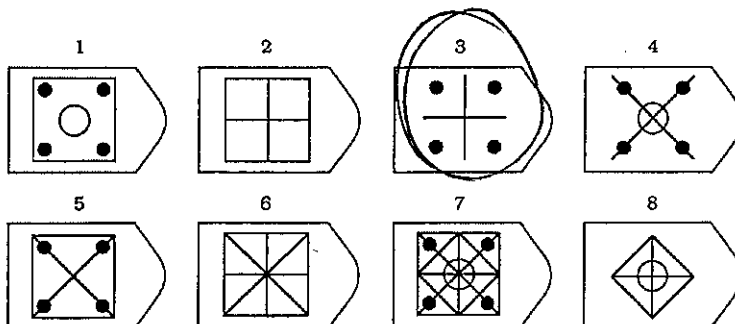
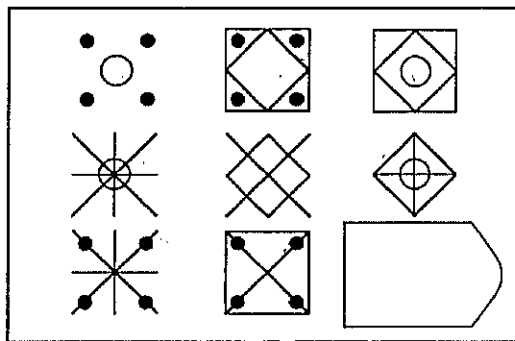


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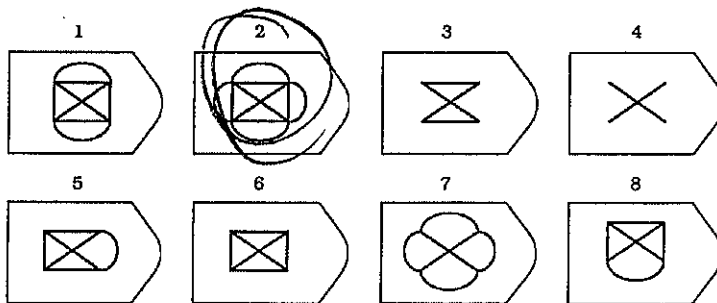
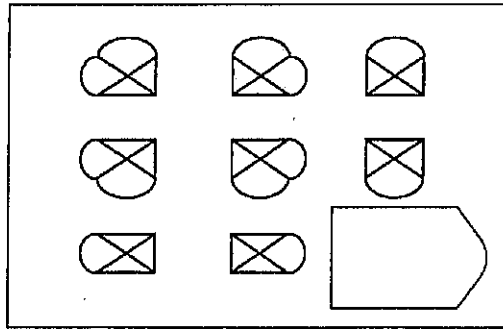
PATTERN 3



PATTERN 4



PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

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Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

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PLEASE CONTINUE ON NEXT PAGE

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- ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

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PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
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-

Please choose the response that is closest to an analogy that you might make.

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- C. Blowing bubbles. They are similar because they both float until they eventually pop.
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2. Catching a cold is like...

- A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- ☒ E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 49855

What is your gender?

☐ Male

☒ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☒ Caucasian

☐ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A42707740
Version A

GROUP: C26

91

MULTIPLE-CHOICE. 5 points each (50 points total).

- B 1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- The magma becoming colder
 - ☒ Gas bubbles forming in the magma
 - The surrounding crust becoming hotter
 - Crystals forming in the magma
- C 2. Which of the following would be considered a negative feedback to increasing global temperature?
- Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☒ An increase in evaporation and cloud formation resulting in the release of latent heat
 - An increase in desert formation resulting in more dusting blowing into the atmosphere
- C 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- A= erosion, B= deposition, C= uplift and erosion
 - A = erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - A = dissolution, B= deposition, C= uplift and deposition
- B 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- Human activities are the primary cause of the greenhouse effect.
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 - Human activities and natural processes are roughly equal causes of the greenhouse effect.
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- ☒ An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
- B 6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- Reservoir A has a shorter residence time than Reservoir B.
 - ☒ Reservoir B has a shorter residence time than Reservoir A.
 - Reservoir A and Reservoir B have equal residence times.
 - More information about Reservoir A and Reservoir B is needed.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

- B 7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
- A 8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- B 9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
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- D 10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - ☒ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

A) Ocean acidification is a process by which the oceans have or obtain a lower PH (hence become more acidic)

This process happens through a series of events. Carbon dioxide as a gas in the hydrosphere can combine with water to create HCO_3^- and H^+ . There, mainly H^+ , why? is what make the oceans more acidic.

B) There are 2 scenarios that will be played out:

1) Increase in atmospheric CO_2 leading to more CO_2 in the hydrosphere (since systems tend toward equilibrium). This, in effect, would lead to more acidic oceans because more CO_2 would change to HCO_3^- and H^+ to obtain equilibrium. This is negative feedback.

2) Increase in atmospheric CO_2 will lead to an increased atmospheric temperature as well as increased ocean temperature. Since warmer water holds less CO_2 , the oceans would in fact become less acidic as the temperature rises more and more.

This is a positive feedback because more CO_2 leads to higher temps in hydrosphere which results in more CO_2 in atmosphere.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

A) The greenhouse effect is the process by which the planet is warmed and inhabitable? Incoming visible light from the sun is not absorbed by Greenhouse gases (GHG) but reaches the Earth's surface and is absorbed or reflected depending on what it hits. Reflected light returns to space while absorbed is transmitted to IR or infrared. This infrared makes its way back to outer space but GHG's instead absorb it and emit a portion of it back to the Earth causing it to warm.

24 B) Volcanism releases CO_2 and sulfur, each with a largely different effect. The CO_2 is a GHG and therefore would cause an increase in atmospheric temperature. HOWEVER, if volcanoes release sulfur and large ash clouds, visible sunlight will not even hit the Earth and will be reflected instead. This would cause a decently fast relief of warming and a process of cooling.

Extra credit (2 points).

2 How are evaporation and degassing similar and/or different?

Evaporation transforms liquid to gas. Degassing is gas to gas. Both are hydrosphere \rightarrow atmosphere interactions.

Earn up to 1 additional point on your course grade

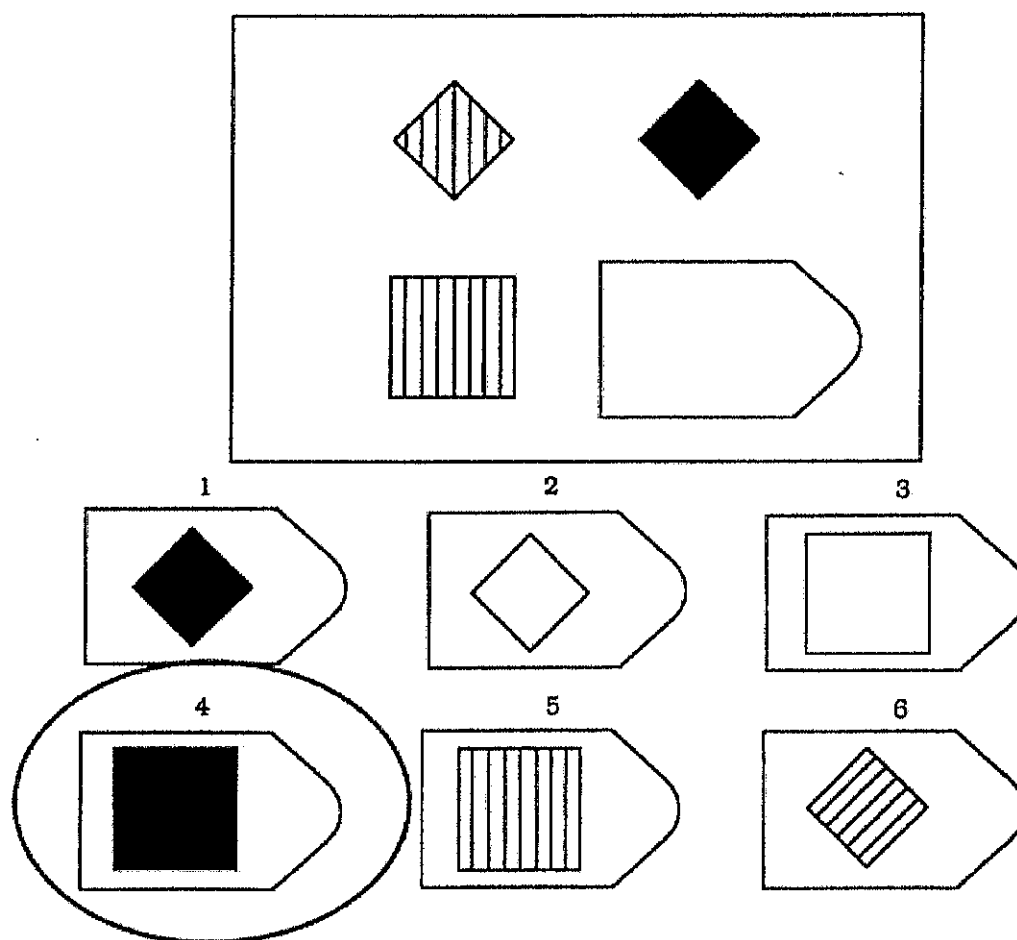
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

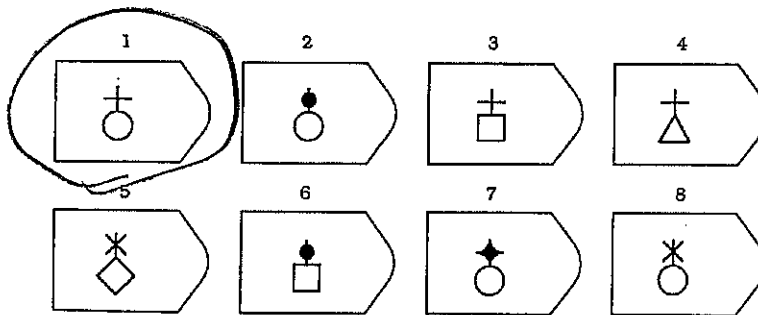
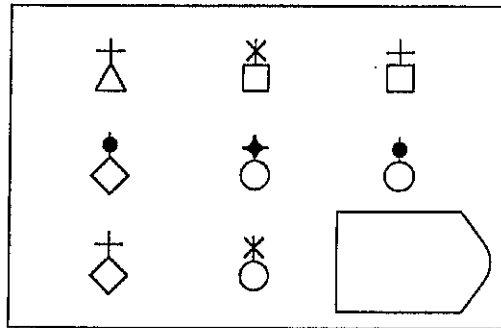


Answer: 4

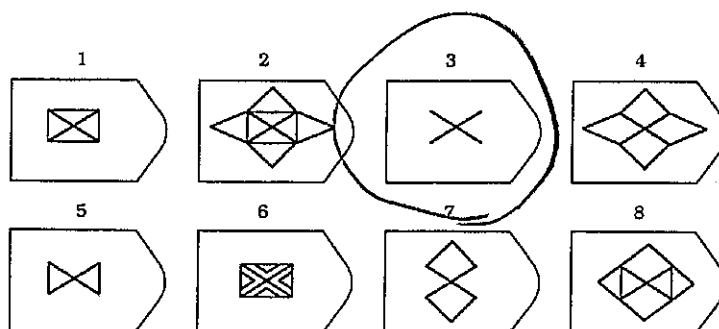
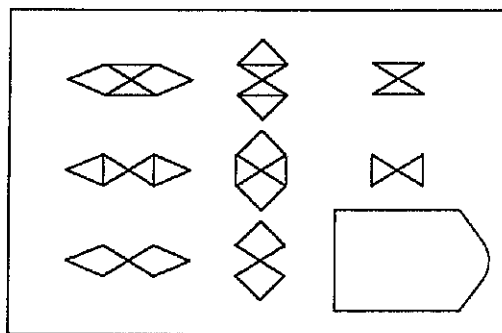
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Please choose the image that best completes each of the following patterns.

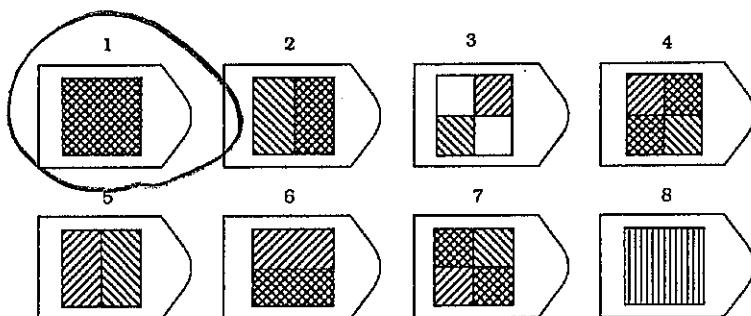
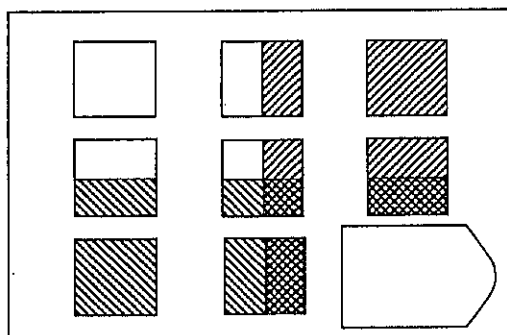
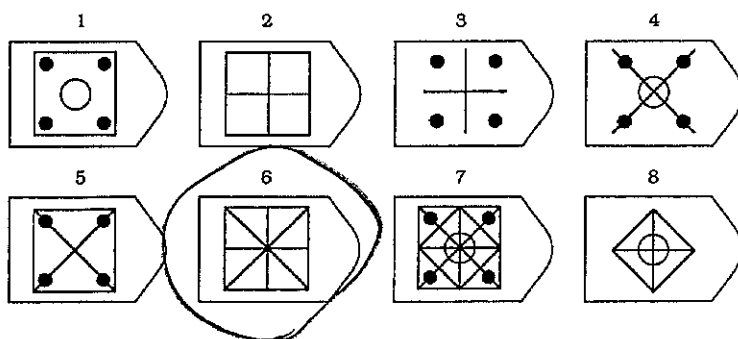
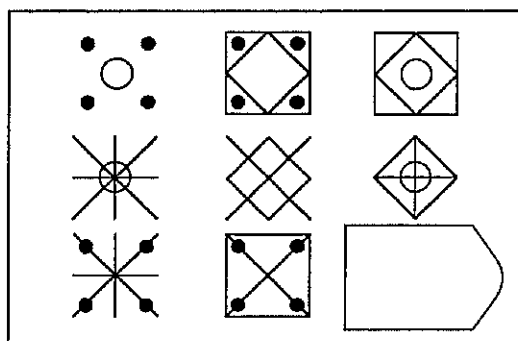
PATTERN 1



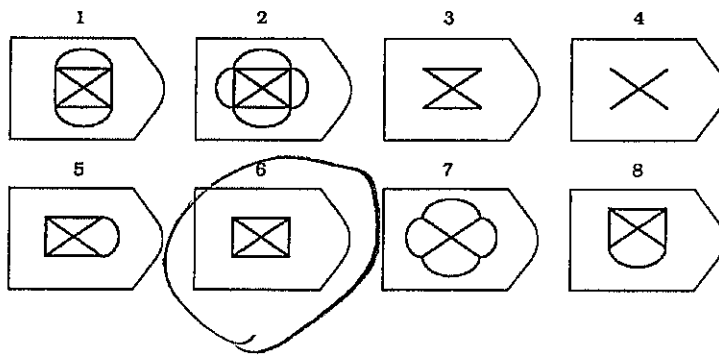
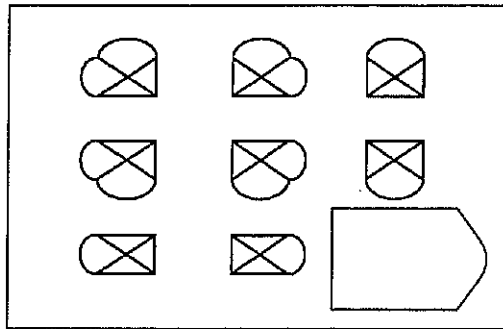
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

- A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.
- B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
- ☒ C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
- D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
- B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
- C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
- ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

- ☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
- B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
- C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
- D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

- A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
- B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
- ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
- D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- B. A leaf in the air. They are similar because they both move through the air carried by the wind.
- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- ☒ E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48823

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A42422266
Version B

GROUP: 

25

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- ☐ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - ☒ b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☐ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- ☐ a. The magma becoming colder
 - ☐ b. Gas bubbles forming in the magma
 - ☐ c. The surrounding crust becoming hotter
 - ☒ d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- ☐ a. A= erosion, B= deposition, C= uplift and erosion
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 - ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
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4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- ☐ a. Human activities are the primary cause of the greenhouse effect.
 - ☒ b. Natural processes are the primary cause of the greenhouse effect.
 - ☐ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - ☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - ☐ e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- ☐ a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - ☐ c. Reservoir A and Reservoir B have equal residence times.
 - ☐ d. More information about Reservoir A and Reservoir B is needed.
6. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☐ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - ☐ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☒ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?

- ~~a. The reservoir will eventually disappear.~~
 B ☒ b. The reservoir is not in equilibrium.
~~c. The reservoir is growing smaller.~~
~~d. The reservoir's residence time is 10 years.~~



~~8.~~ What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- a. The Earth's atmosphere would become colder than it is today.
 D ☒ b. The Earth's atmosphere would become warmer than it is today.
 c. The Earth's atmosphere would remain about the same temperature as it is today.
~~d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.~~

~~9.~~ Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- ~~a. Reflection of more solar radiation, causing atmospheric temperature to decrease~~
 C ☒ b. Reflection of more solar radiation, causing atmospheric temperature to increase
~~c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase~~
~~d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease~~

☒ 10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- ~~a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.~~
 B ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
~~c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.~~
~~d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.~~

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

3

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Ocean acidification is dealing with the density and temperature in the ocean, and how it fluctuates throughout the carbon cycle.

Positive: when carbon dioxide is present, temperatures increase as the density & buoyancy increase as well.

Negative: when carbon dioxide is not present, ocean acidification is down and therefore colder as well.
less dense & buoyant.



ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- b. Clear connections between events and changes in atmospheric temperature.

This would affect the atmospheric temperature by increasing it. When volcanoes erupt & large ash clouds appear, it affects the earth's atmosphere as it in a sense becomes polluted and therefore radiation is not allowed out after coming in & being reflected from the sun. With clouds of ash, radiation cannot go through.

The after-math of the volcano and large ash clouds will be an increase in temperature. Radiation will be absorbed in clouds & therefore unable to be released back into the outer atmosphere causing the increase in temperature.



Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Similar: transition as well as gravitational change in each process as both involve an increase in gravitational energy. Different: dealing w/ water vs. magma.

Earn up to 1 additional point on your course grade

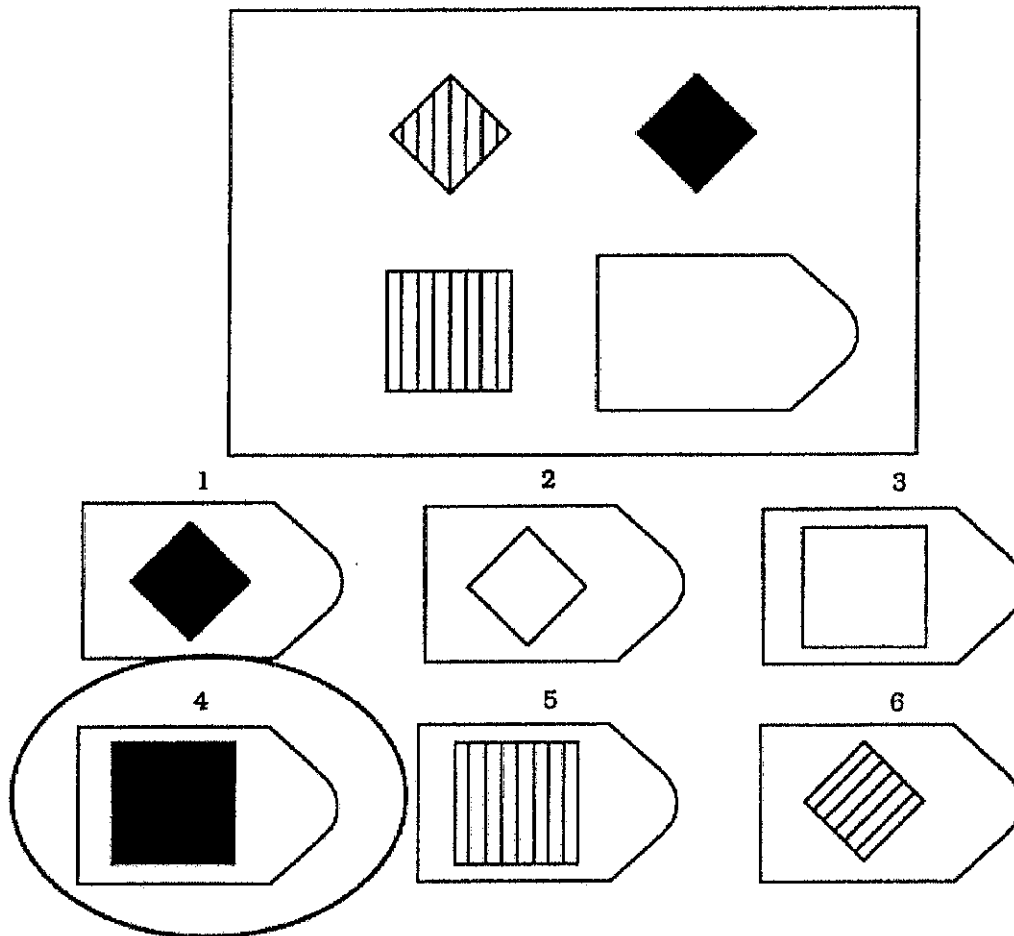
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Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

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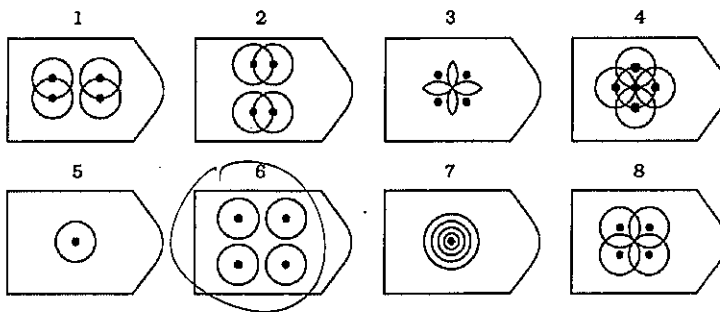
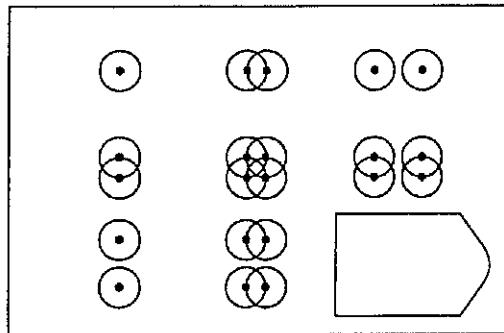


Answer: 4

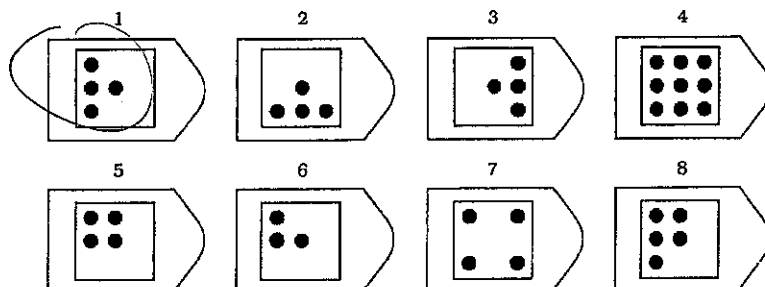
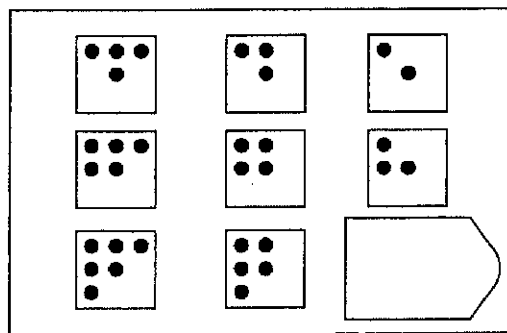
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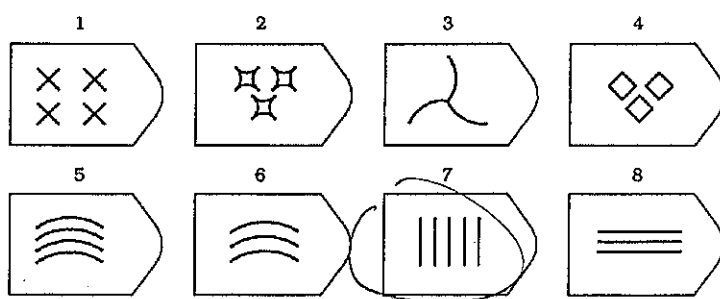
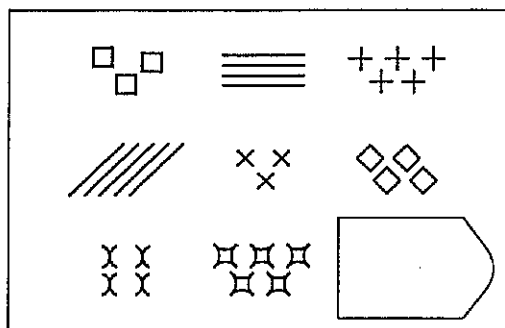
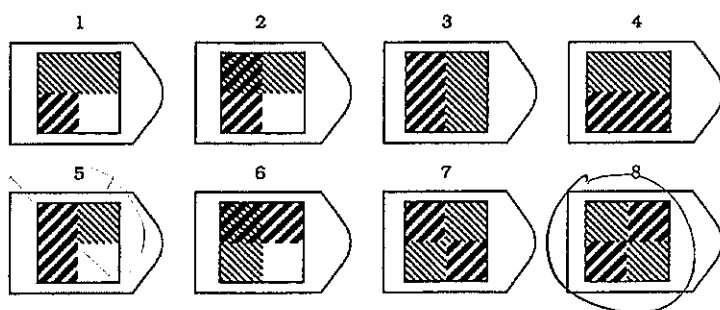
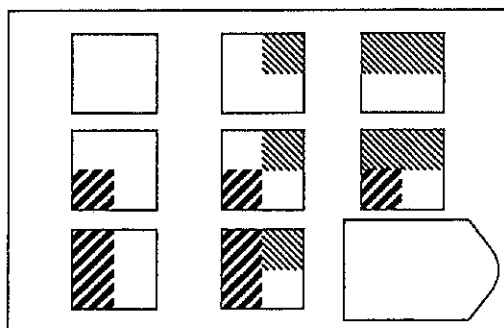
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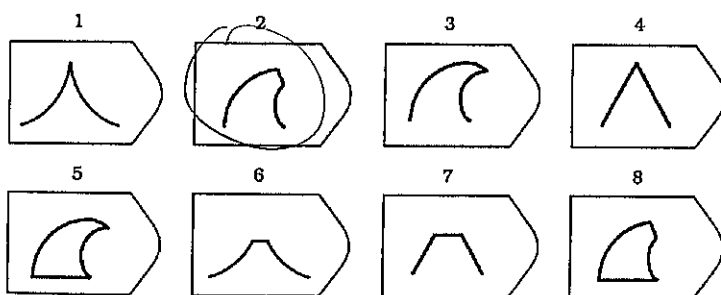
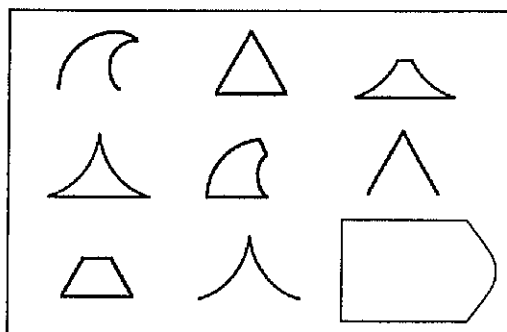
PATTERN 1



PATTERN 2



PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- ☒ A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☐ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- ☒ C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- ☒ D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☐ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- ☒ B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- ☒ C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- ☒ D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- ☒ A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- ☐ B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- ☒ C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- ☐ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- ☒ A. After eating a big lunch, Dan went back to his office and took a nap.
- ☐ B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- ☐ C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- ☐ D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- ☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
- ☒ B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
- ☒ C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
- ☒ D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- ☒ A. Getting high. They are both involve too much of a chemical influencing the body.
- ☒ B. Hitting your head. They both involve something that causes headaches.
- ☒ C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- ☒ A. Dew forming. They are similar because they both involve a drop in temperature.
- ☒ B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☒ C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 49464

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: 142704999
Version B

GROUP: C27

40

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- ☐ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - ☒ b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☐ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
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 - ☐ d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- ☐ a. A= erosion, B= deposition, C= uplift and erosion
 - ☒ b. A= erosion, B= biochemical precipitation, C= uplift and deposition
 - ☐ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - ☐ d. A= dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- ☒ a. Human activities are the primary cause of the greenhouse effect.
 - ☐ b. Natural processes are the primary cause of the greenhouse effect.
 - ☐ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - ☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - ☐ e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- ☐ a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
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- ☐ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - ☒ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- a. The reservoir will eventually disappear.
- ☒ b. The reservoir is not in equilibrium.
- c. The reservoir is growing smaller.
- d. The reservoir's residence time is 10 years.

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- ☒ a. The Earth's atmosphere would become colder than it is today.
- b. The Earth's atmosphere would become warmer than it is today.
- ☐ c. The Earth's atmosphere would remain about the same temperature as it is today.
- d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- ☐ b. Reflection of more solar radiation, causing atmospheric temperature to increase
- c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
- d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
- b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
- ☒ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

The Acidity of the ocean depends on CO_2 and the temperature. If there is an increase of CO_2 in the atmosphere, that will cause an increase of CO_2 in the ocean, thus causing the pH level to drop, increasing the acidity of the ocean. This is a positive feedback because the CO_2 will increase in every other reservoir, if it increases in the atmosphere. A negative feedback would be if the CO_2 were to decrease and the ocean returned back to its original pH level

20

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

If there was an increase of volcanic activity, the amount of ash in the air would block out the sun, decreasing the amount of light/^{heat} allowed into the earth's atmosphere. This factor would cause the earth's temperature to decrease, causing a mini Ice Age. However, with an increase of greenhouse gases—gases in the air that absorb visible rays causing the earth's temperature to rise—

~~from the eruption,~~ the earth's temperature should increase because the gases are holding in what light does penetrate through the ash. Therefore, a direct increase or decrease is not known because both an increase and decrease are possible.

5

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Earn up to 1 additional point on your course grade

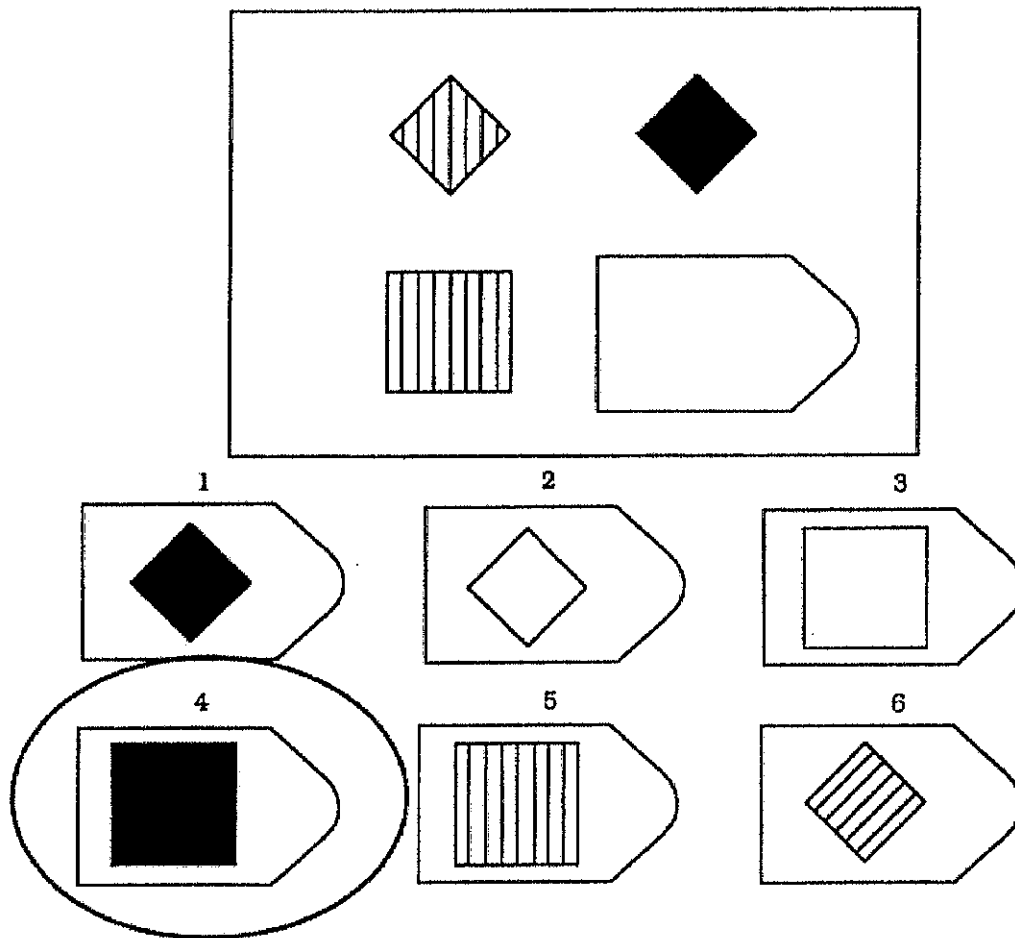
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

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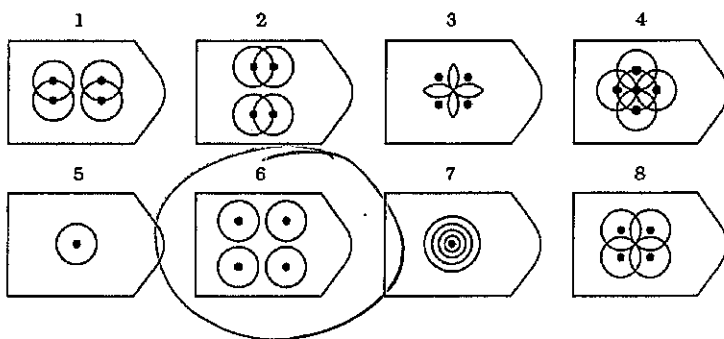
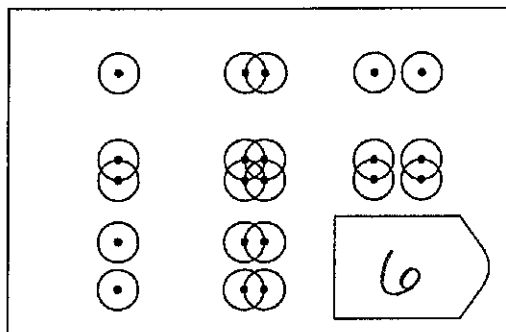


Answer: 4

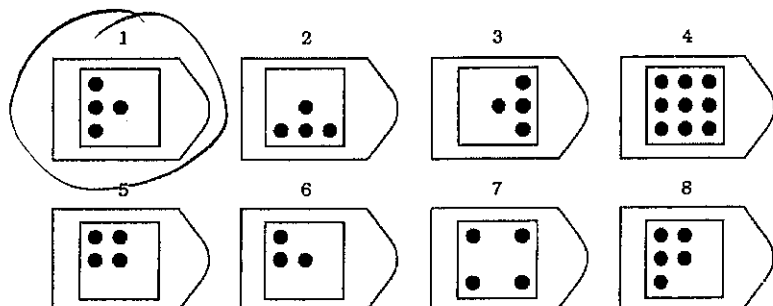
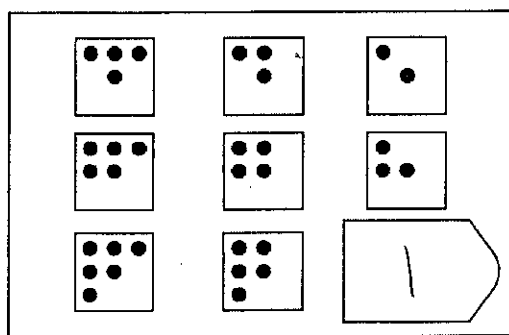
PLEASE CONTINUE ON NEXT PAGE

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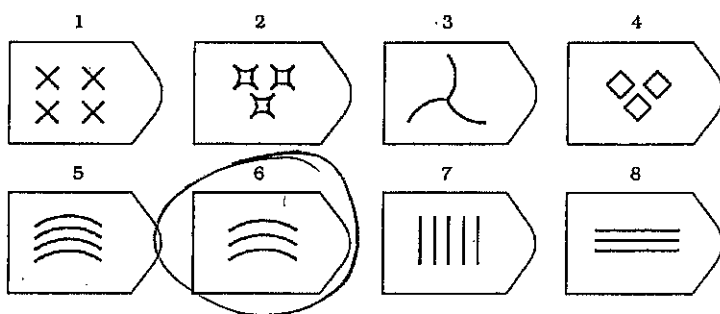
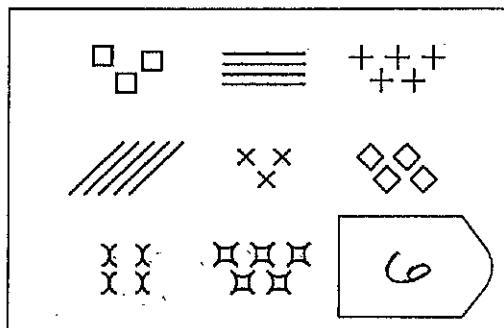
PATTERN 1



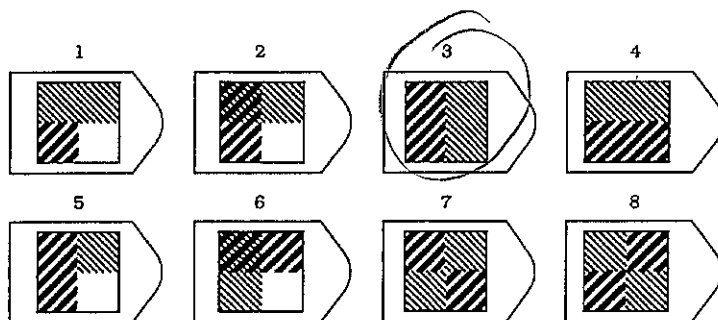
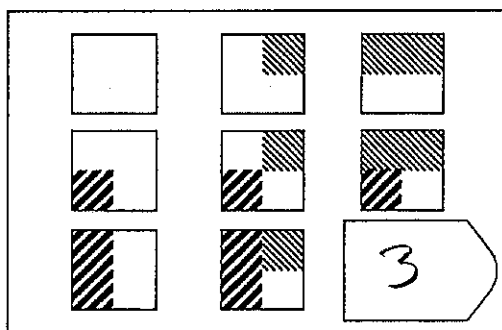
PATTERN 2

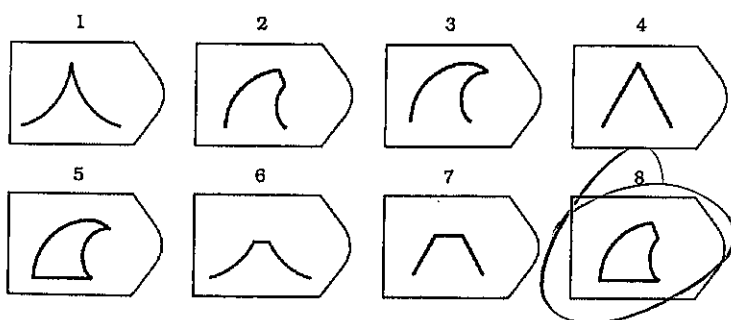
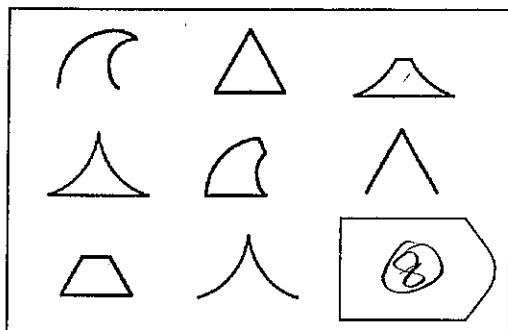


PATTERN 3



PATTERN 4



PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

A. While debugging their broken firewall, a programmer came across top-secret CIA files.

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C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.

D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.

B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.

C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.

D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.

B. Bob was able to maximize his work time by cutting back on watching TV during the day.

C. Sean has been closely monitoring his eating in an attempt to improve his diet.

☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

A. After eating a big lunch, Dan went back to his office and took a nap.

B. When the debate went badly, Ann decided to put more time into developing convincing arguments.

☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.

D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
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 - D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

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- ☒ A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
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- D. Eating too much candy. They both involve lack of self-control.
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2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☒ C. Clouds forming. They are similar because they both involve a phase change.
- ☒ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48336

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A42669614
Version B

GROUP: C27

37

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
- Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - ☒ Melting of permafrost resulting in more methane escaping into the atmosphere
 - An increase in evaporation and cloud formation resulting in the release of latent heat
 - An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- The magma becoming colder
 - ☒ Gas bubbles forming in the magma
 - The surrounding crust becoming hotter
 - Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- A= erosion, B= deposition, C= uplift and erosion
 - A= erosion, B= biochemical precipitation, C= uplift and deposition
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4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- ☒ Human activities are the primary cause of the greenhouse effect.
 - Natural processes are the primary cause of the greenhouse effect.
 - Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - Neither human activities nor natural processes are important causes of the greenhouse effect.
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5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
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6. Which of the following would cause the acidity of Earth's oceans to decrease?
- An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
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7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- The reservoir will eventually disappear.
 - ☒ The reservoir is not in equilibrium.
 - The reservoir is growing smaller.
 - The reservoir's residence time is 10 years.
8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- The Earth's atmosphere would become colder than it is today.
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 - The Earth's atmosphere would remain about the same temperature as it is today.
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9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- Reflection of more solar radiation, causing atmospheric temperature to decrease
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10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide would make the oceans more acidic. When there is carbon dioxide in the atmosphere, carbon dioxide and ^{water} become joined ~~in~~ the atmosphere.

The water and carbon dioxide condense in clouds then precipitation takes place. The water from the precipitation is more acidic from the atmospheric carbon dioxide. Eventually the acidic water re-enters the atmosphere through evaporation. The more acidic the oceans are, the more concentrated, and therefore, the more carbon dioxide that re-enters the atmosphere, since carbon dioxide is a greenhouse gas, global warming will increase. The positive feedback loop in the process of ocean acidification is as atmospheric carbon dioxide increase so does ocean acidification because both are increasing. The negative feedback loop is that less of the sun's energy is absorbed so the Earth's temperature will increase.

1

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

explain
If volcanism was to suddenly increase dramatically, the Earth's atmospheric temperature would decrease. When volcanoes erupt and large ash clouds enter the atmosphere, the Sun's heat energy is unable to pass through the large amounts of ash. If the Sun's energy is not able to hit the Earth then the temperatures will decrease because the ash would absorb the Sun's heat energy rather than the Earth.

5

1

1

Extra credit (2 points).

How are evaporation and degassing similar and/or different? They are different because evaporation is when water becomes gas form and degassing is when gasses are released.

Earn up to 1 additional point on your course grade

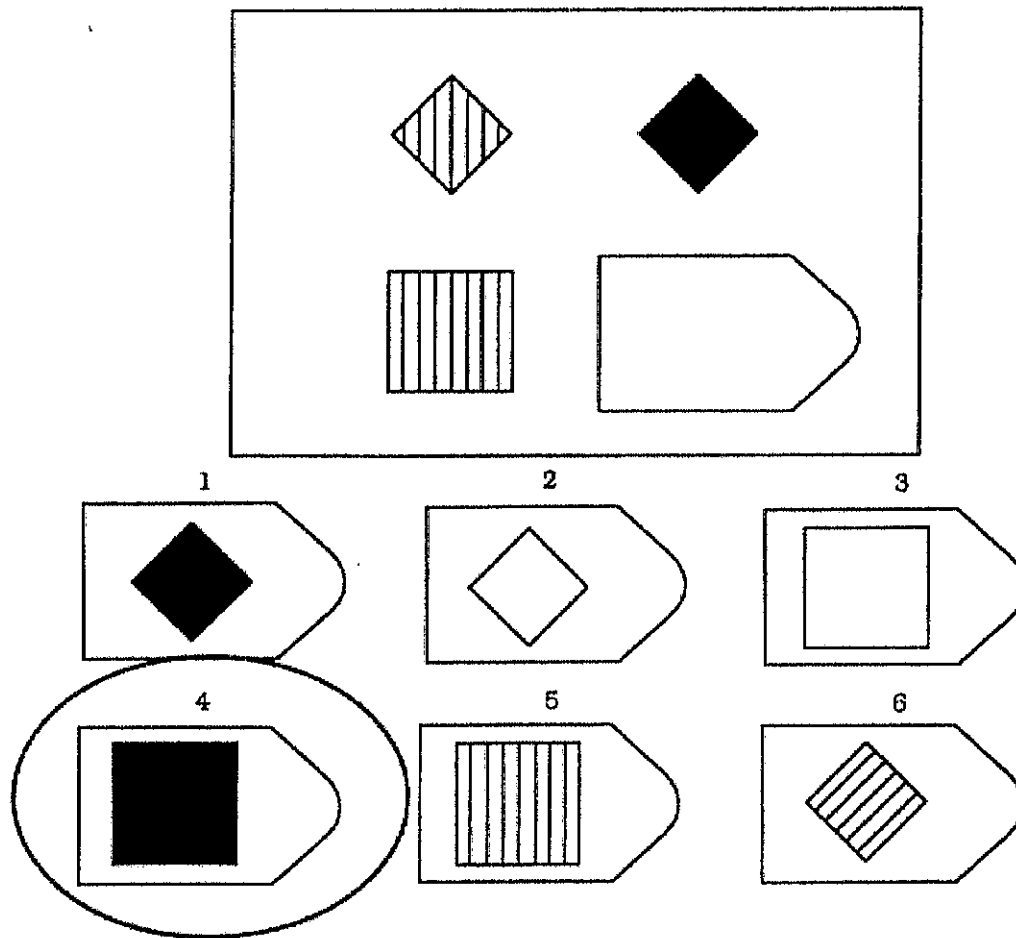
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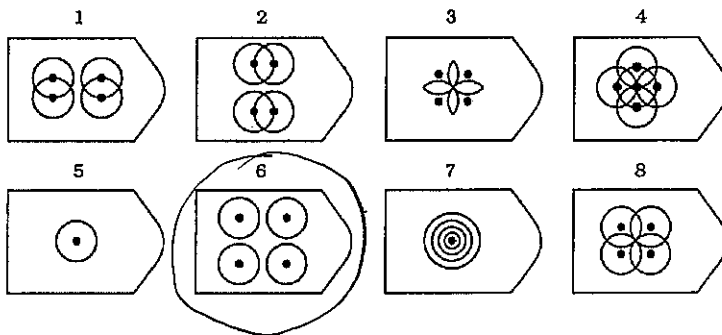
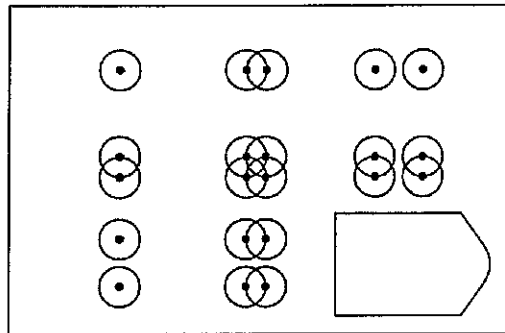


Answer: 4

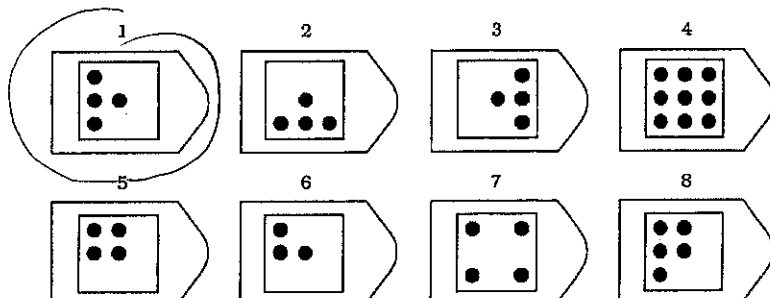
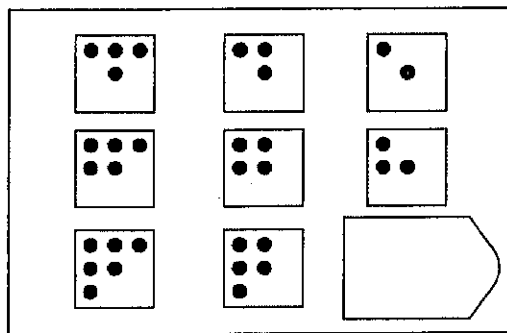
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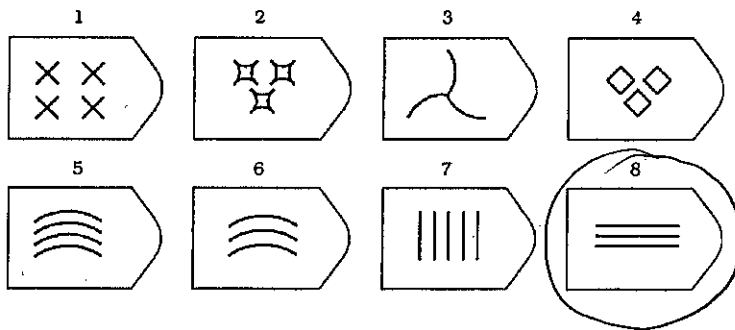
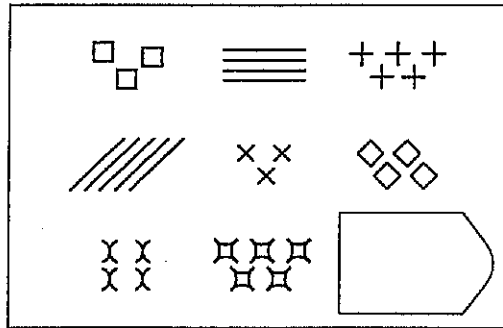
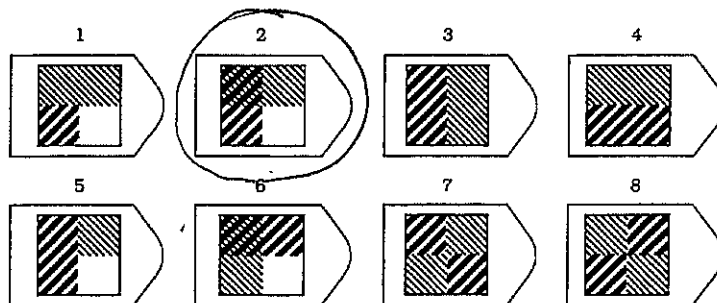
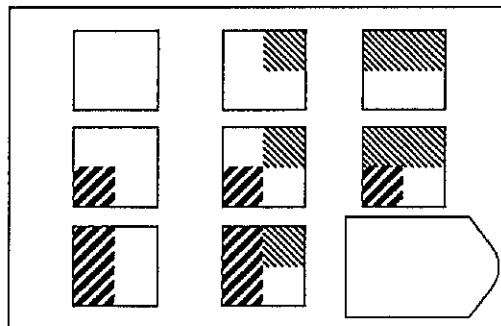
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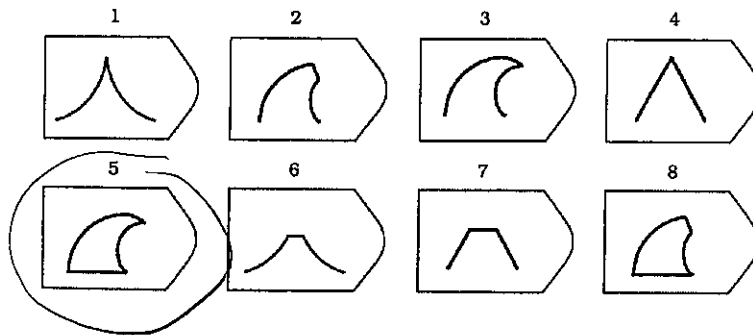
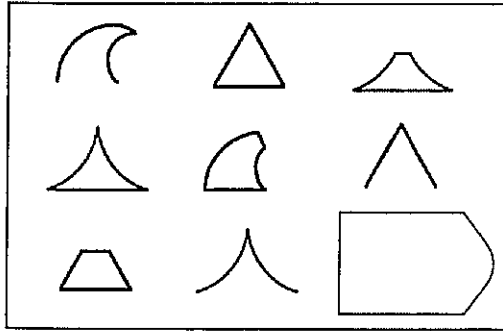
PATTERN 1



PATTERN 2



PATTERN 3**PATTERN 4**

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DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48306

What is your gender?

- ☐ Male
- ☒ Female
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What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
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- ☐ Latino/Hispanic
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- ☐ Native American
- ☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A40967142
Version B

GROUP: C27

90

MULTIPLE-CHOICE. 5 points each (50 points total).

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- ☐ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
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 - ☐ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.



7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

$$\frac{1000}{50} = 20$$

- ☒ a. The reservoir will eventually disappear.
☒ b. The reservoir is not in equilibrium.
☒ c. The reservoir is growing smaller.
☒ d. The reservoir's residence time is 10 years.

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☒ d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- ☒ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
☒ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
☒ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Ocean acidification refers to the process of carbon dioxide combining with water to release HCO_3^- (bicarbonate) and hydrogen ions. The resulting hydrogen atoms make the water acidic. Increasing the carbon dioxide in the atmosphere will increase the amount of carbon dioxide available to react with water in the oceans. This is an example of a positive feedback loop: more carbon dioxide in the atmosphere creates more carbon trying to find equilibrium in the oceans by changing with water to produce HCO_3^- and H^+ , which increases ocean acidification. A positive feedback loop would lead to more carbon dioxide in the atmosphere from the bicarbonate undergoing several process, which would make the whole process continue.

On the other side, an increase in atmospheric carbon dioxide will cause the earth's temperature to increase. With more greenhouse gases more infrared rays will be absorbed and maintained in the earth. As the earth heats, ocean temperature will also rise. Warmer water holds less carbon than cold water. Therefore the ocean will have less carbon dioxide to combine with water. Ocean acidification would then decrease. A negative feedback loop shows that as carbon dioxide increases, temperature increases, and carbon in oceans decreases. The process stops because the system is in equilibrium,

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

20 There are three main ways in which volcanic eruptions may influence atmospheric temperature. First of all, when a volcano erupts, the sulfate and other chemicals it produces are sent into the atmosphere and can travel long distances. Then when it rains the acidic rain comes down onto the earth. This can affect plant and animal life, which will change the flux of carbon in our atmosphere and therefore change greenhouse gases. The greenhouse effect is the second way volcanic eruptions can change Earth's atmospheric temperature. When volcanoes erupt, a lot of carbon is let into the atmosphere. Carbon dioxide, methane, and water are the three main gases that create a sort of "insulation" for the earth. These gases do not absorb visible light emitted by the sun so the UV (and some IR) rays make its way to the Earth's surface where it is converted to infrared energy. The greenhouse gases absorb the heat that is being reflected so that it stays in the atmosphere, instead of escaping back into space. Initially, it may seem like a volcanic eruption will increase the atmospheric temperature. By increasing the amount of greenhouse gases, more heat is absorbed and the earth is warmed, but volcanoes also produce massive ash clouds that cover the atmosphere and prevent visible light from the sun to be let in at all. Therefore there is no energy to convert to heat to absorb in greenhouse gases. This causes the atmospheric temperature to drop.

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Both process move the substance into the atmosphere as a gas however evaporation refers to the movement of water and degassing refers to the carbon cycle.

Earn up to 1 additional point on your course grade

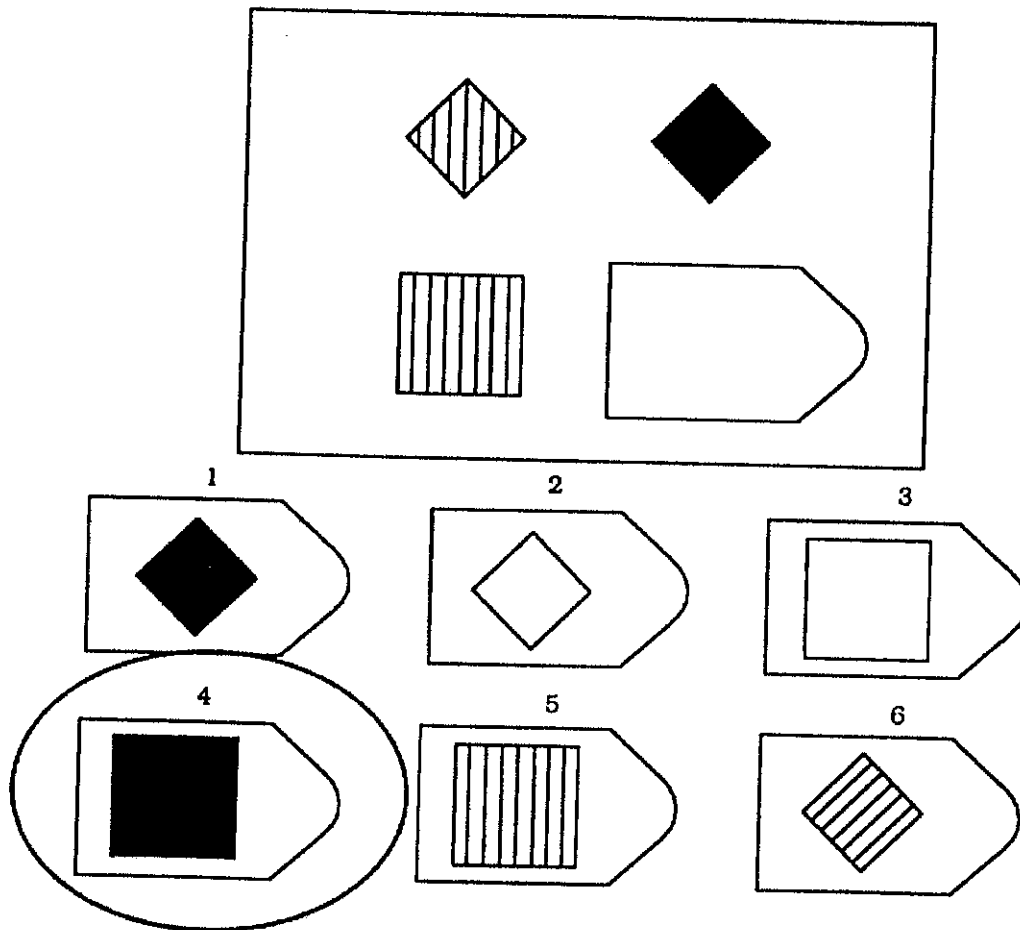
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

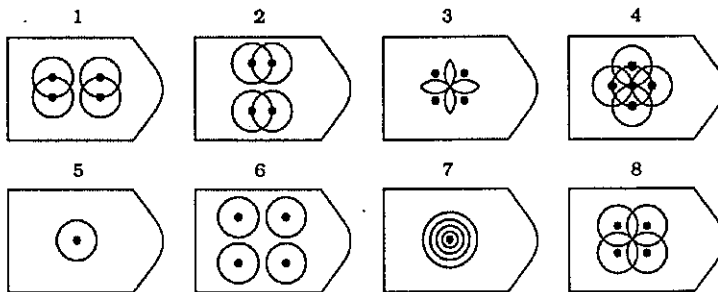
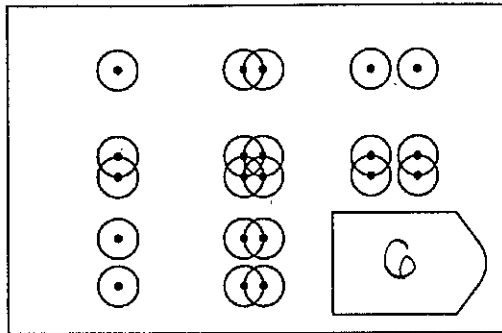


Answer: 4

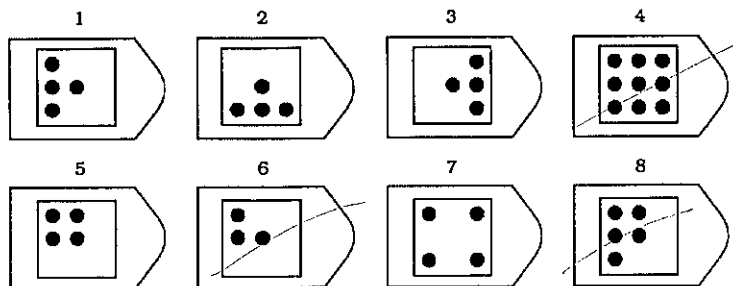
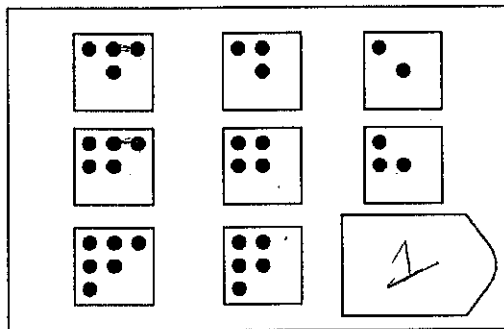
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

PATTERN 1

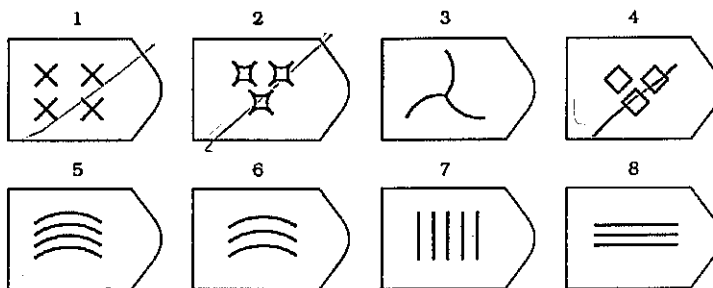
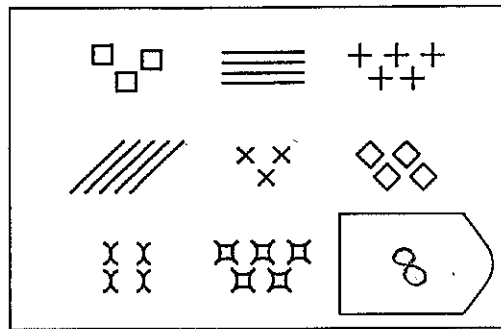


PATTERN 2

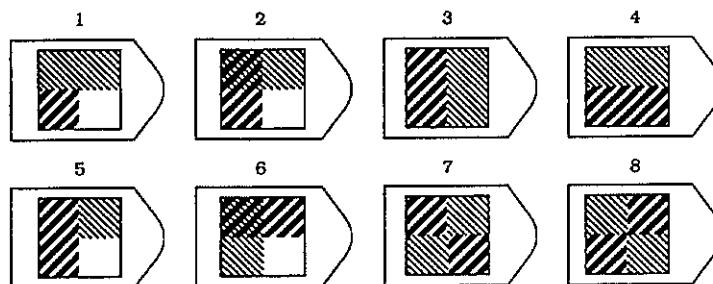
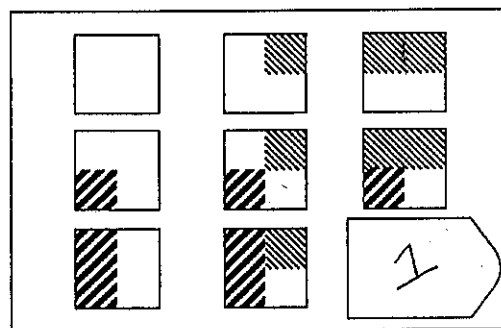


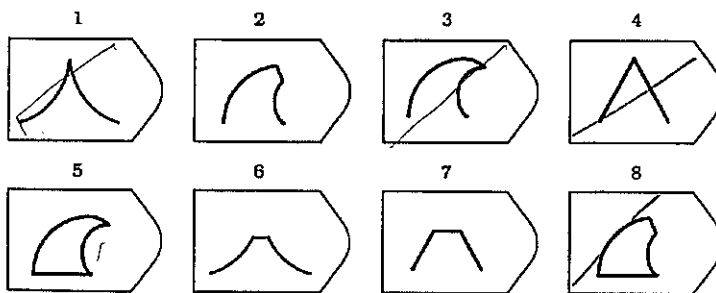
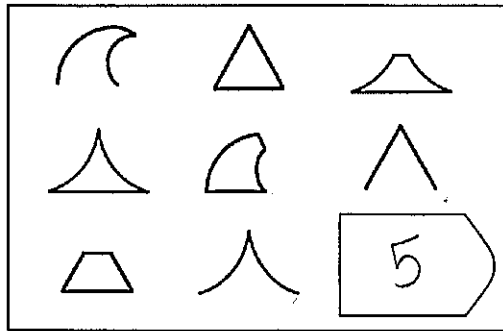
PLEASE CONTINUE ON NEXT PAGE

PATTERN 3



PATTERN 4



PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- ☐ A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- ☐ C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- ☐ D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- ☐ B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- ☐ C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- ☐ D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- ☐ A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- ☐ B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- ☐ C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- ☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- ☐ A. After eating a big lunch, Dan went back to his office and took a nap.
- ☐ B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- ☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- ☐ D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.

☒ B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.

☒ C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.

D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

☒ A. Getting high. They are both involve too much of a chemical influencing the body.

B. Hitting your head. They both involve something that causes headaches.

C. Being sleep deprived. They both involve impaired functions.

D. Eating too much candy. They both involve lack of self-control.

E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

☒ A. Dew forming. They are similar because they both involve a drop in temperature.

B. Blowing up a balloon. They are similar because they both involve becoming less dense.

C. Clouds forming. They are similar because they both involve a phase change.

D. Building a house. They are similar because they both involve building a structure.

} All true?

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48823

What is your gender?

☐ Male

☒ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☐ Caucasian

☒ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A41930966
Version A

GROUP: C28

MULTIPLE-CHOICE. 5 points each (50 points total).

40

- D 1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - ☒ d. Crystals forming in the magma
- a 2. Which of the following would be considered a negative feedback to increasing global temperature?
- ☒ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
- D 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - ☒ d. A = dissolution, B= deposition, C= uplift and deposition
- B 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - ☒ b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - ☒ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
- C 5. Which of the following would cause the acidity of Earth's oceans to decrease?
- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☒ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
- C 6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
 - ☒ c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.

- B 7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
- C 8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- D 9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - ☒ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
- A 10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Ocean acidification is directly related to Atmospheric Carbon Dioxide. If there's more CO_2 in the air, more will be in the ocean water.

The Carbon dioxide (CO_2) reacts with water (H_2O) producing carbonic acid (HCO_3^-) and hydrogen atoms (H^+). Positive feedback would be when the ~~carbonic acid~~ ^{Carbon dioxide} is processed at the same rate it enters water from the atmosphere. An increase in ocean temperature resulting in a

faster $\text{CO}_2 \rightarrow \text{HCO}_3^- + \text{H}^+$ would be a negative feedback loop, as it pulls the ocean water away from equilibrium.

slower

20

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

Sudden dramatic increases in volcanic activity would result in a higher temperature in Earth's atmosphere. The clouds of ash that would be erupted into the atmosphere would greatly increase the greenhouse effect. The sun emits visible radiation in all directions. Things like glaciers and ice sheets are very important as they reflect much of this energy back to space. Gases in the atmosphere known as greenhouse gases absorb that reflected energy and direct it in all directions as well. The radiation that is sent back to earth is absorbed (warming) or entered through the greenhouse cycle again. So the ash from the volcanoes would act as greenhouse gas, causing a warming of Earth's atmosphere.

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

They are similar because they're both processes where matter undergoes a change of state. They're different because evaporation isn't

Earn up to 1 additional point on your course grade

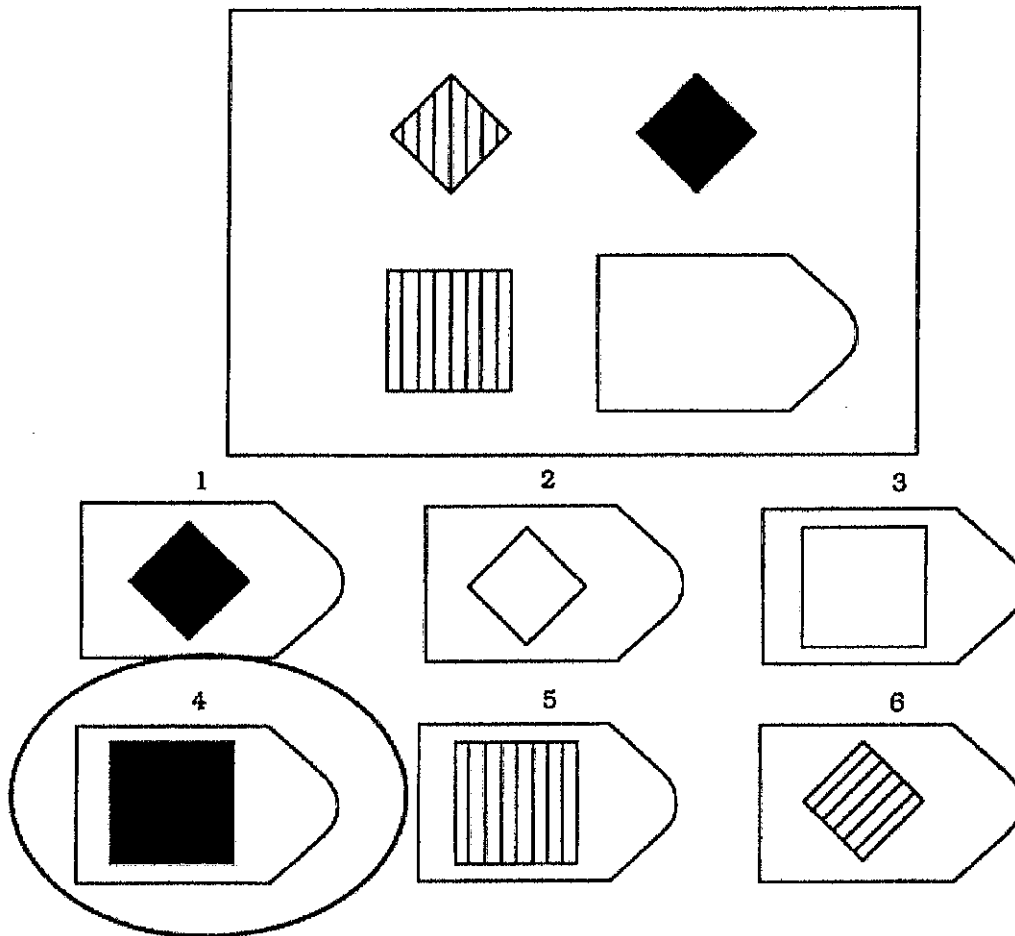
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

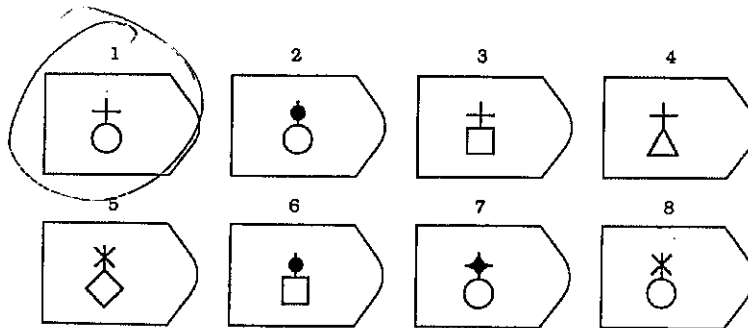
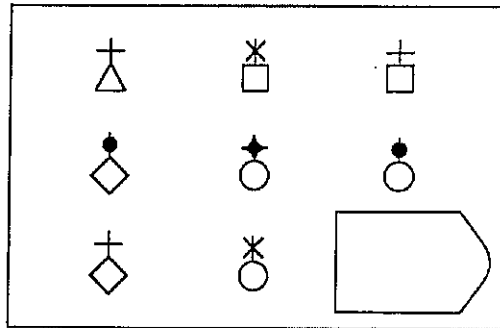
Example



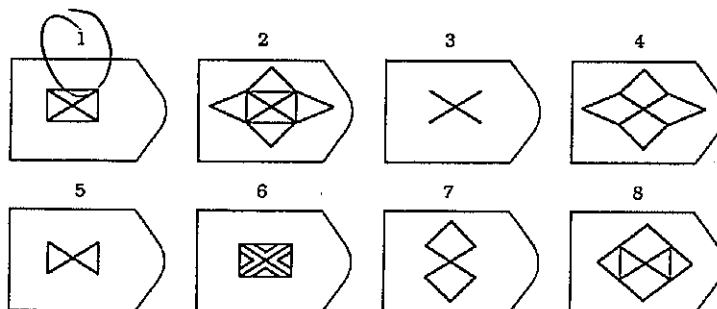
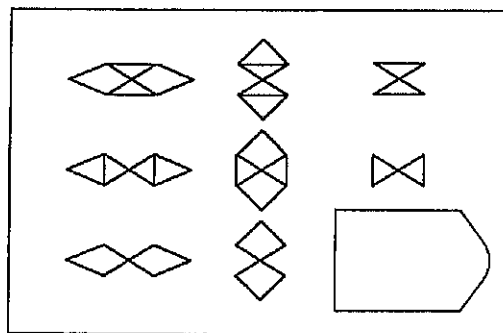
Answer: 4

Please choose the image that best completes each of the following patterns.

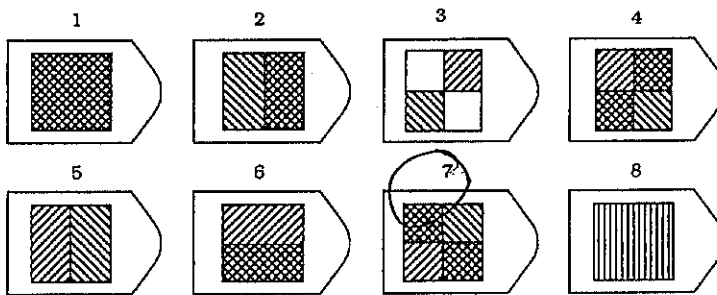
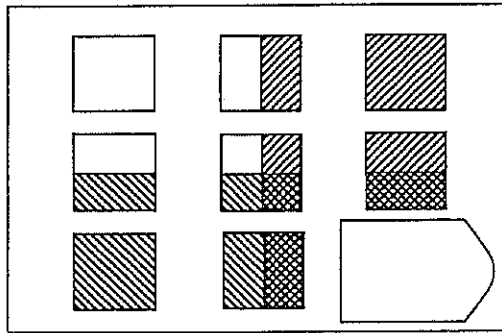
PATTERN 1



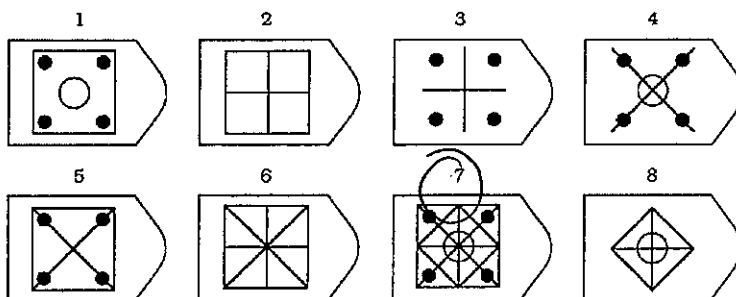
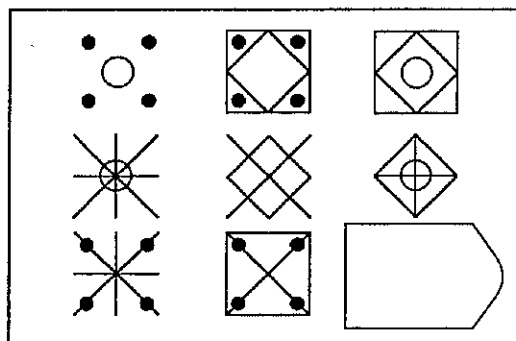
PATTERN 2



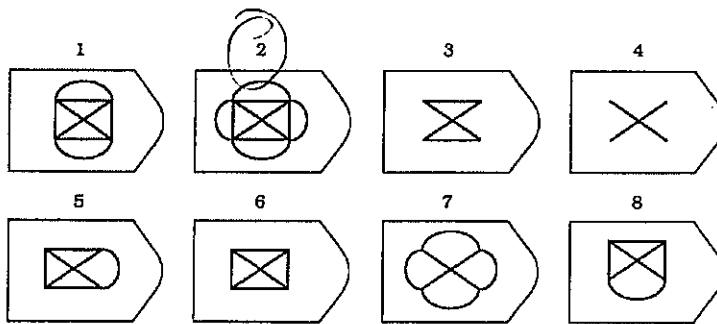
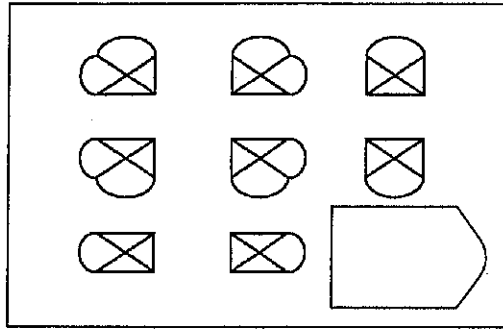
PATTERN 3



PATTERN 4



PATTERN 5



In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

B

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.

☒ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.

C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.

D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

D

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

A. Before the annual parade, the city council decided to renovate one of the buildings downtown.

B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.

C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.

☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

a

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.

B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.

C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.

D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

B

4. The rival gangs used graffiti to define their territorial boundaries.

A. The toddler wrote on the walls with pens when the babysitter wasn't looking.

☒ B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.

C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.

D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - ☒ C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...
- A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
 - B. A leaf in the air. They are similar because they both move through the air carried by the wind.
 - C. Blowing bubbles. They are similar because they both float until they eventually pop.
 - ☒ D. A cloud in the sky. They are similar because they both float and are carried by the wind.
2. Catching a cold is like...
- A. Getting the flu. They are similar because they are both caused by viruses.
 - B. Getting pink eye. They are similar because they are both contagious.
 - C. Getting the flu. They are similar because they are both caused by not washing your hands.
 - ☒ D. Forgetting to do your homework. They are similar because they are both preventable.
 - E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48446

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A40678097
Version A

GROUP C28

80

MULTIPLE-CHOICE. 5 points each (50 points total).

- B 1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- The magma becoming colder
 - ☒ Gas bubbles forming in the magma
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 - Crystals forming in the magma
- D 2. Which of the following would be considered a negative feedback to increasing global temperature?
- Melting of ice sheets resulting in more visible energy from the Sun being absorbed
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- A= erosion, B= deposition, C= uplift and erosion
 - A = erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - A = dissolution, B= deposition, C= uplift and deposition
- C 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- Human activities are the primary cause of the greenhouse effect.
 - Natural processes are the primary cause of the greenhouse effect.
 - ☒ Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - Neither human activities nor natural processes are important causes of the greenhouse effect.
 - The human and natural causes of the greenhouse effect are not understood.
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- ☒ An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
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 - ☒ Reservoir A and Reservoir B have equal residence times.
 - More information about Reservoir A and Reservoir B is needed.

- B 7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
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- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
- B 9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
- D 10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- a. The Earth's atmosphere would become colder than it is today.
 - b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - ☒ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)**1. How would an increase in atmospheric carbon dioxide affect ocean acidification?**

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

A. An increase in atmospheric carbon dioxide would raise the pH of the ocean, but, the increased atmospheric carbon dioxide could also increase atmospheric temperature. The increase in atmospheric temperature would increase ocean temperature, which would lower the water's ability to hold CO_2 . Overall, the oceans pH would rise, unless the atmospheric temperature increased significantly.

B. Negative feedback doesn't contribute to an overall process, while positive feedback does. In ocean acidification, an example of positive feedback is the increase of carbon in the atmosphere leads to an increase of carbon in the ocean, when the ocean degasses, it contributes to the carbon in the atmosphere. An example of negative feedback is when increased atmospheric carbon warms the ocean, which decreases its ability to hold CO_2 so the ocean doesn't significantly contribute to the cycle.

25

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

A. Atmospheric temperature is influenced by heat trapping gases in the atmosphere, such as greenhouse gases (GHGs). When solar radiation reaches Earth, some radiation is absorbed, while some is reflected back into space and [some is trapped] within the atmosphere by GHGs. GHGs are both naturally occurring and man-made and have properties that allow them to retain heat within the atmosphere and warm the Earth. Volcanic ash serves as a GHG in the example given.

B. An increase in volcanic ash will first decrease Earth's temperature because it will be so thick that solar radiation is unable to pass through. However, the ash will still retain the remaining GHGs in the atmosphere and once it disperses it will allow solar radiation in and retain it, which will increase atmospheric temperature overall.

20

69

P Extra credit (2 points).
How are evaporation and degassing similar and/or different?

Both involve chemical changes the movement (rising) of a substance.

Earn up to 1 additional point on your course grade

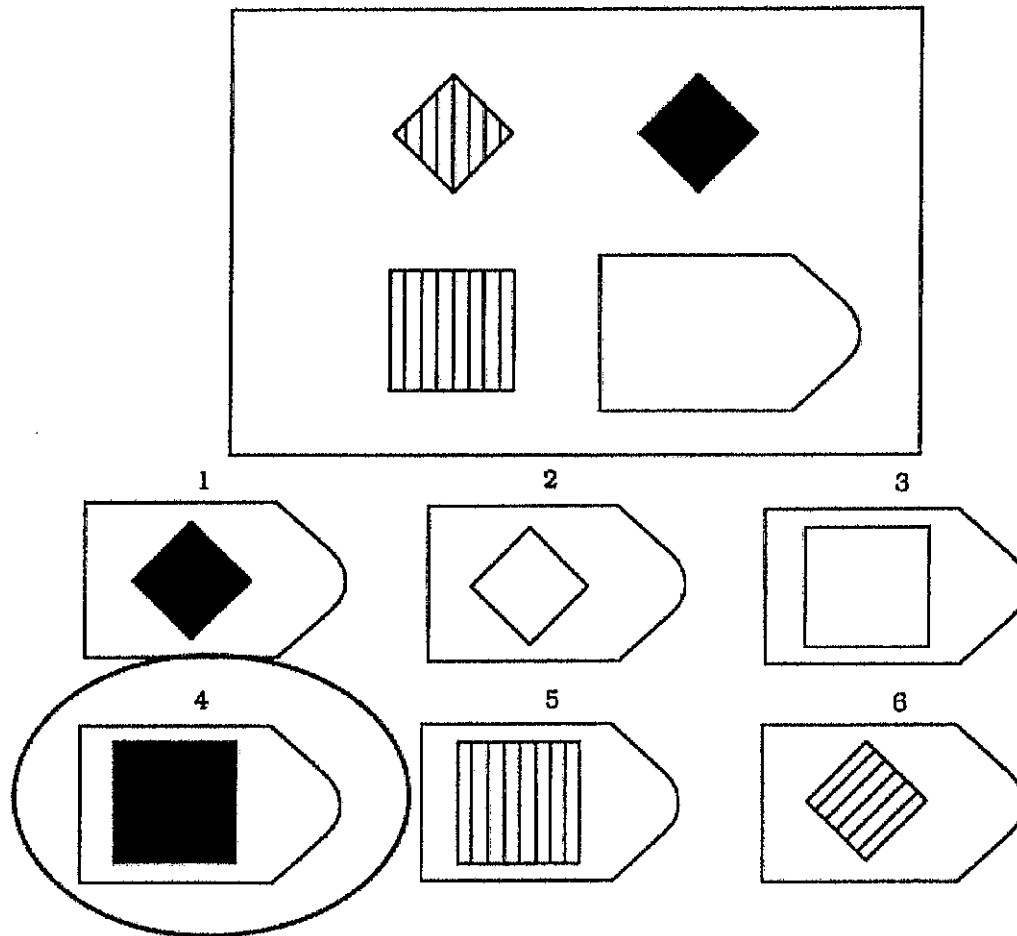
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

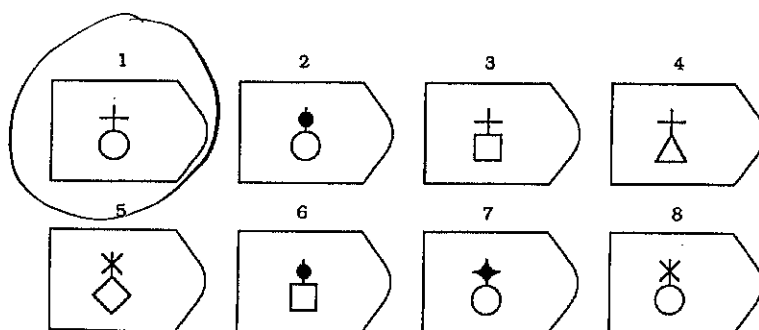
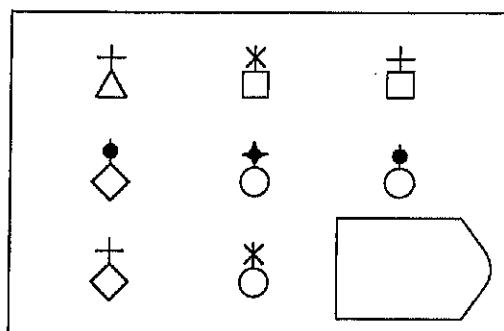


Answer: 4

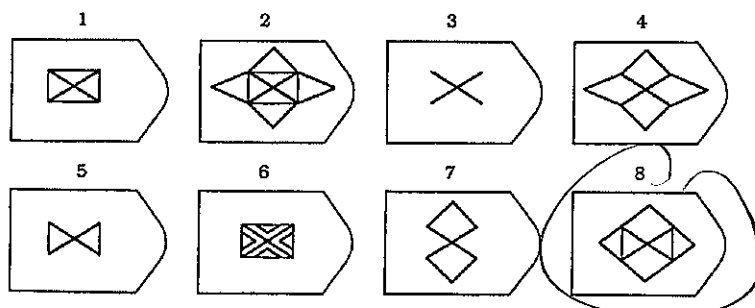
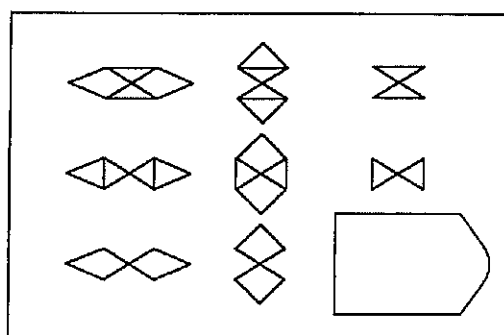
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Please choose the image that best completes each of the following patterns.

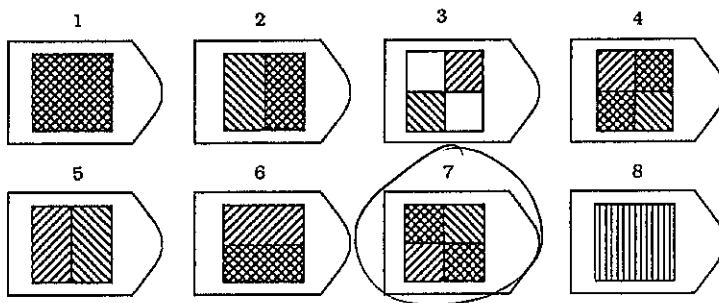
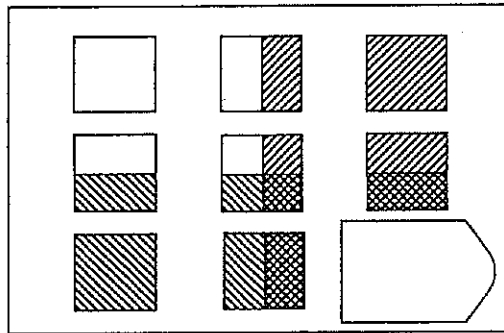
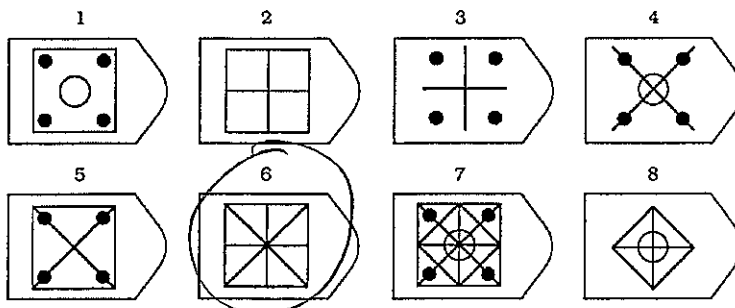
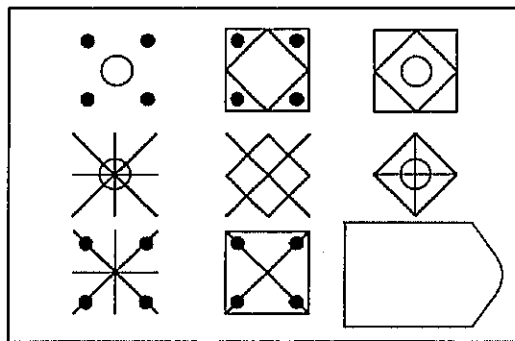
PATTERN 1



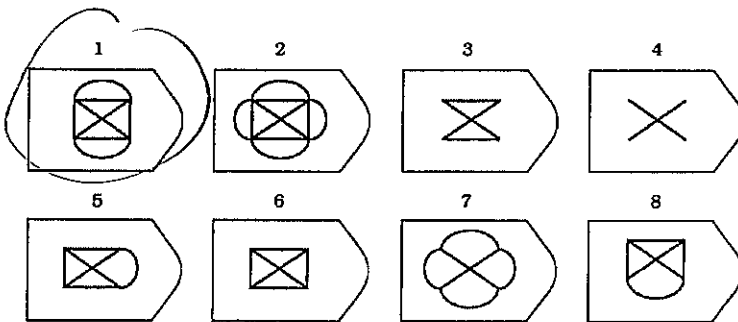
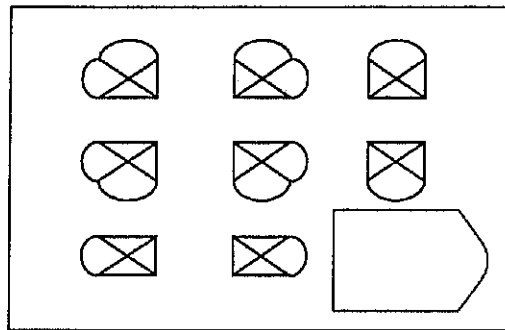
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

- A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.
- ☒ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
- C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
- D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
- B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
- C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
- ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

- ☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
- B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
- C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
- D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

- A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
- B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
- ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
- D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- B. A leaf in the air. They are similar because they both move through the air carried by the wind.
- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- ☒ A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 20 years

What is your home zip code? 48876

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A43876396
Version A

GROUP: _____

C28

65

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- ☐ a. The magma becoming colder
☒ b. Gas bubbles forming in the magma
☐ c. The surrounding crust becoming hotter
☐ d. Crystals forming in the magma

2. Which of the following would be considered a negative feedback to increasing global temperature?

- ☐ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
☐ b. Melting of permafrost resulting in more methane escaping into the atmosphere
☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
☐ d. An increase in desert formation resulting in more dusting blowing into the atmosphere

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- ☐ a. A= erosion, B= deposition, C= uplift and erosion
☐ b. A = erosion, B= biochemical precipitation, C= uplift and deposition
☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
☐ d. A = dissolution, B= deposition, C= uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- ☒ a. Human activities are the primary cause of the greenhouse effect.
☐ b. Natural processes are the primary cause of the greenhouse effect.
☐ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
☐ e. The human and natural causes of the greenhouse effect are not understood.

5. Which of the following would cause the acidity of Earth's oceans to decrease?

- ☐ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
☒ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

6. Imagine two CO_2 reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO_2 influx and CO_2 outflow are equal. Which reservoir has the shorter residence time?

- ☐ a. Reservoir A has a shorter residence time than Reservoir B.
☒ b. Reservoir B has a shorter residence time than Reservoir A.
☐ c. Reservoir A and Reservoir B have equal residence times.
☐ d. More information about Reservoir A and Reservoir B is needed.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?

- B
- ☐ a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - ☐ c. The reservoir is growing smaller.
 - ☐ d. The reservoir's residence time is 10 years.

8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- A
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ☐ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - ☐ c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - ☐ d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- B
- ☐ a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - ☐ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - ☐ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- A
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - ☐ b. The Earth's atmosphere would become warmer than it is today.
 - ☐ c. The Earth's atmosphere would remain about the same temperature as it is today.
 - ☐ d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

23 Ocean acidification is when the carbon dioxide in the atmosphere is absorbed by the oceans and once the ocean absorbs the CO_2 it goes through a chemical process that turns that CO_2 and some water into hydrogen hydrocarbonate, two very acidic chemicals. This to a certain extent is good for the oceans, but too much can cause problems. Therefore, if there was an increase in carbon dioxide in the atmosphere that would also increase ocean acidification as it absorbs carbon dioxide from the air to start the process. This could cause a positive feedback loop for ocean acidification as more CO_2 in the air and more acidic chemicals in the ocean would increase the process of ocean acidification. However, increased CO_2 in the atmosphere would cause the atmosphere to heat, thus heating the oceans as well and warmer oceans absorb less CO_2 in the atmosphere this would cause a negative feedback loop slowing down the process.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

When there is volcanism occurring on Earth it does two main things to increase Earth's atmospheric temp. One, releases heat into the atmosphere. Two, volcanoes release large ash clouds into the atmosphere. These newly released ash clouds act similar to the greenhouse effect as it traps current heat inside the atmosphere and block out some of the new heat trying to enter into the atmosphere. Therefore, with the new heat released by the volcano and then all of the heat trapped inside our atmosphere from the newly formed ash clouds the Earth's atmospheric temperature would increase.

Volcanos also release some CO_2 into the atmosphere, which will further increase the greenhouse effect, which traps heat inside the atmosphere, thus increasing Earth's atmospheric temperature even more.

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

evaporation and degassing both involve density in their processes as well as both using thermal and chemical energy. evaporation occurs mostly in water bodies, while degassing occurs in molten materials.

Earn up to 1 additional point on your course grade

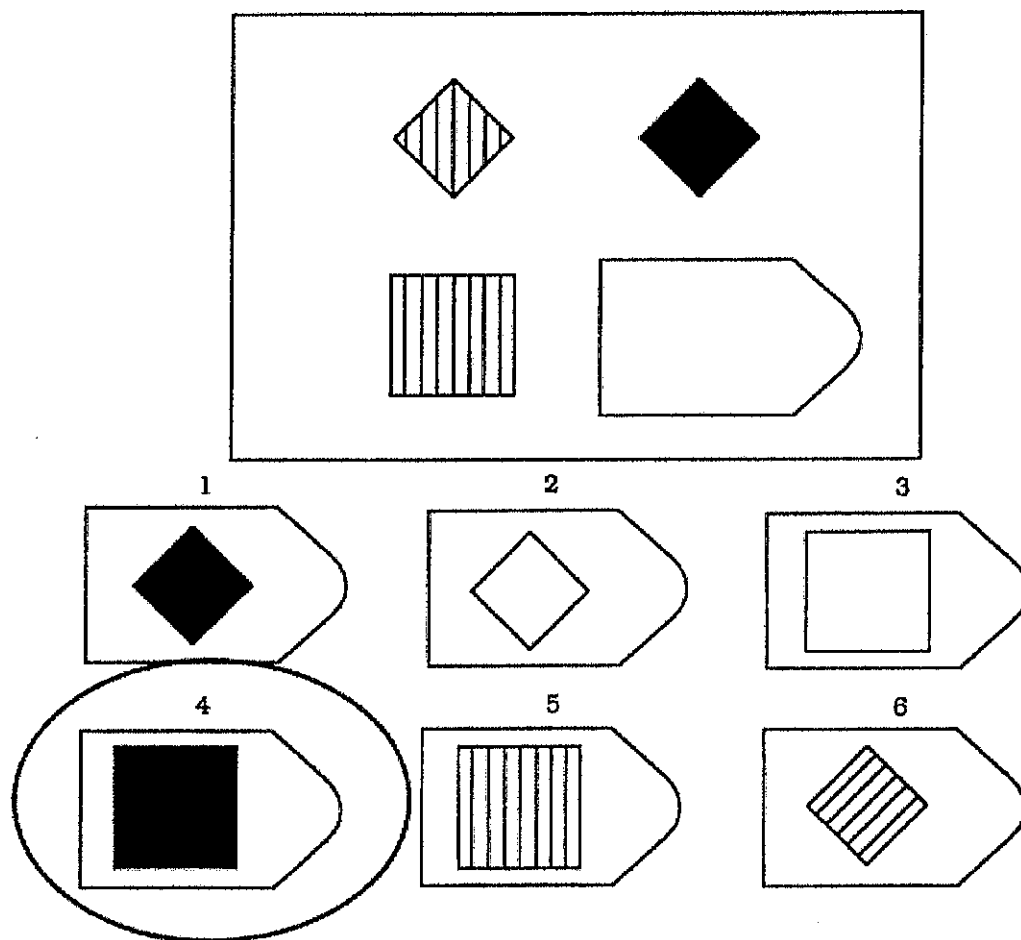
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Thoughtfully complete the attached survey

Analogical Assessment

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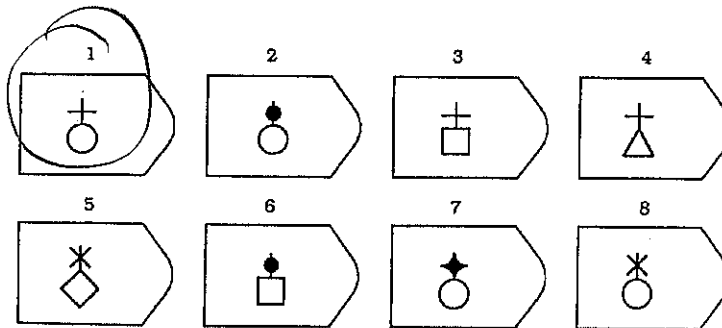
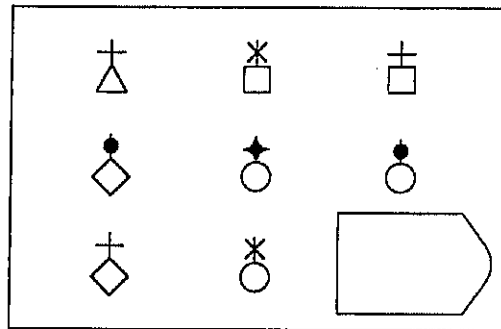


Answer: 4

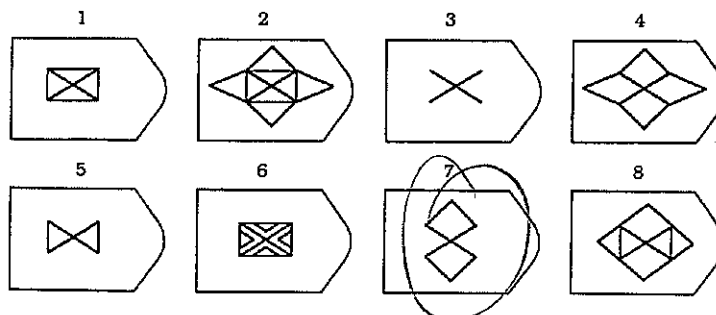
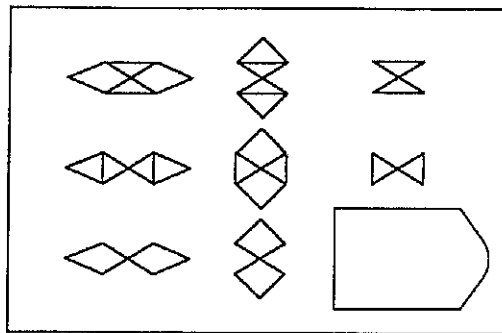
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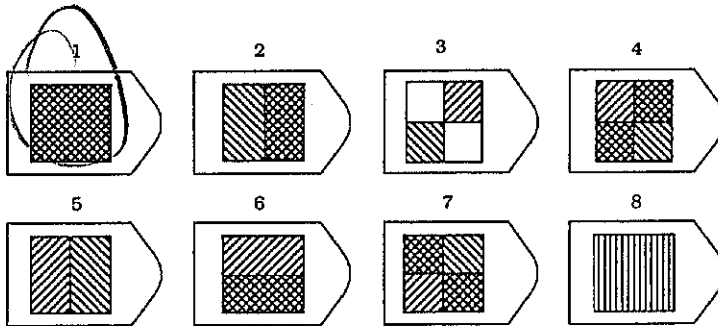
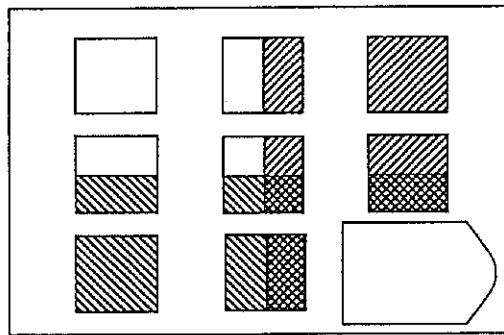
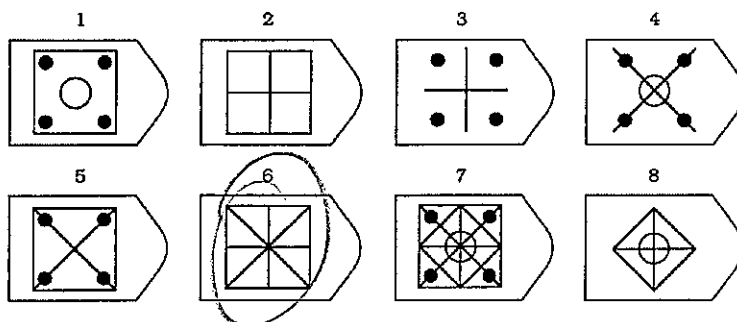
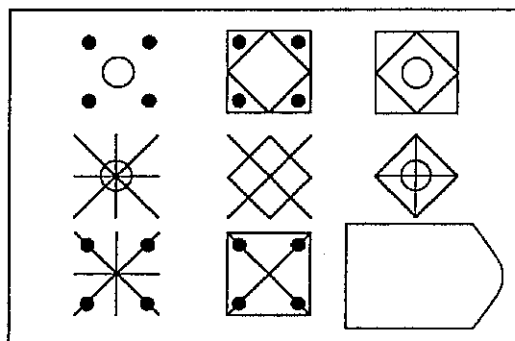
PATTERN 1



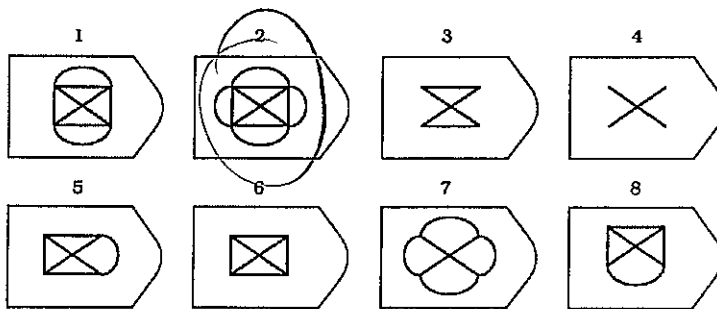
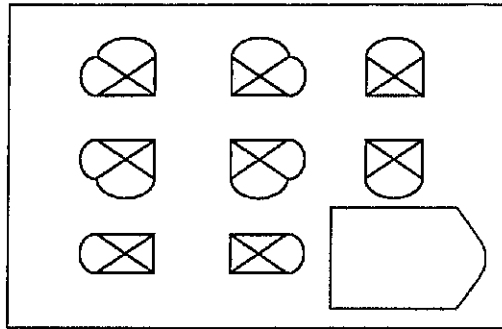
PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

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PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

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☒ B. Allison took her pedigree border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.

C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.

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B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.

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PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
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Please choose the response that is closest to an analogy that you might make.

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- A. Getting the flu. They are similar because they are both caused by viruses.
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 - D. Forgetting to do your homework. They are similar because they are both preventable.
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DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48374

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A41836115
Version A

GROUP: _____

C28

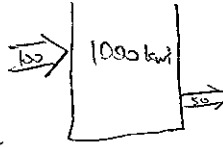
83

MULTIPLE-CHOICE. 5 points each (50 points total).

- B1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- The magma becoming colder
 - Gas bubbles forming in the magma
 - The surrounding crust becoming hotter
 - Crystals forming in the magma
- D2. Which of the following would be considered a negative feedback to increasing global temperature?
- Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - Melting of permafrost resulting in more methane escaping into the atmosphere
 - An increase in evaporation and cloud formation resulting in the release of latent heat
 - An increase in desert formation resulting in more dusting blowing into the atmosphere
- C3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- A= erosion, B= deposition, C= uplift and erosion
 - A = erosion, B= biochemical precipitation, C= uplift and deposition
 - A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - A = dissolution, B= deposition, C= uplift and deposition
- C4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- Human activities are the primary cause of the greenhouse effect.
 - Natural processes are the primary cause of the greenhouse effect.
 - Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - Neither human activities nor natural processes are important causes of the greenhouse effect.
 - The human and natural causes of the greenhouse effect are not understood.
- A5. Which of the following would cause the acidity of Earth's oceans to decrease?
- An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
- B6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- Reservoir A has a shorter residence time than Reservoir B.
 - Reservoir B has a shorter residence time than Reservoir A.
 - Reservoir A and Reservoir B have equal residence times.
 - More information about Reservoir A and Reservoir B is needed.

B 7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?

- a. The reservoir will eventually disappear. \times
- ☒ b. The reservoir is not in equilibrium.
- c. The reservoir is growing smaller.
- d. The reservoir's residence time is 10 years. \times



A 8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- b. Reflection of more solar radiation, causing atmospheric temperature to increase
- c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
- d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

C 9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
- b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
- ☒ c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
- d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

A 10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- ☒ a. The Earth's atmosphere would become colder than it is today.
- b. The Earth's atmosphere would become warmer than it is today.
- c. The Earth's atmosphere would remain about the same temperature as it is today.
- d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide would cause an increase of ocean acidification. Because if more carbon dioxide was absorbed, the pH value of the sea will decrease, which means more acidic. by ocean ✓

positive feedback: An increase in atmospheric carbon dioxide means there are more CO_2 will be absorbed by ocean, this will cause the ocean become more acidic. more acidic ocean would evaporate more CO_2 into the atmosphere.

negative feedback: An increase in atmospheric carbon dioxide means there are more CO_2 will be absorbed by ocean, this will cause the ocean become more acidic. more acidic ocean would evaporate more CO_2 into the atmosphere, it will lead an increase in atmospheric temperature. when temperature goes up, the temperature of ocean goes up along, then there are less CO_2 can be absorbed by ocean because colder water is easier for absorb CO_2 than warmer water.

25

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

greenhouse effect: Sun radiate visible energy to the earth, but earth ground could absorb approximately 47% of it, so the visible energy that is not absorbed are reflected back to the space.

At night, the visible energy that are absorbed by ground convert into infrared energy, this IR energy is easy to absorb by atmosphere. So the most of IR are absorbed by atmosphere. Also, this energy will heat up the temperature of atmosphere. Then this process is repeating like this, this is how greenhouse effect affect Earth's atmospheric temperature.

This increase in volcanism will decrease Earth's atmospheric temperature. Due to the large ash cloud eruption, those ash cloud block the Sun radiation, so the less visible energy pass to atmosphere and absorb by ground, which means less visible energy convert into IR energy. Less IR energy could be absorbed by atmosphere, then the temperature of atmosphere will decrease.

23

25

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

They all emit gas.

Evaporation absorb energy, and the process is thermal energy; degassing release energy by buoyancy.

Earn up to 1 additional point on your course grade

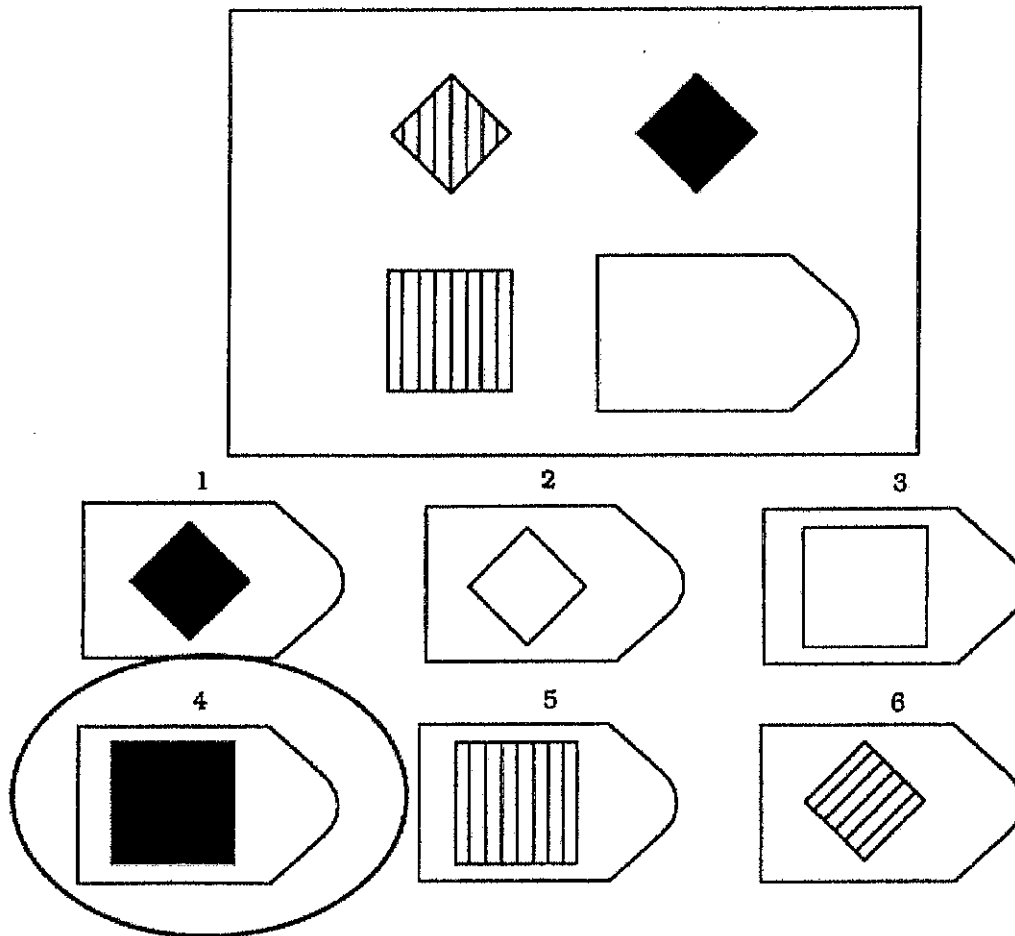
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

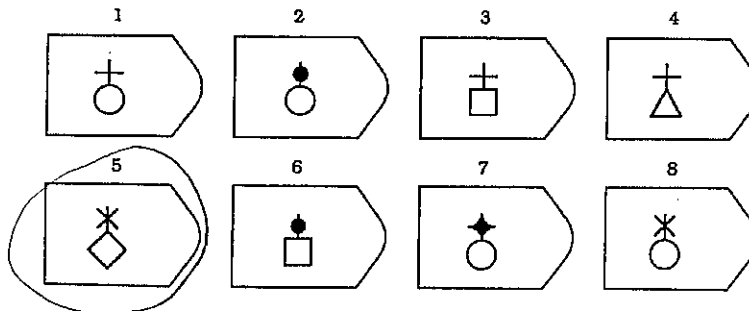
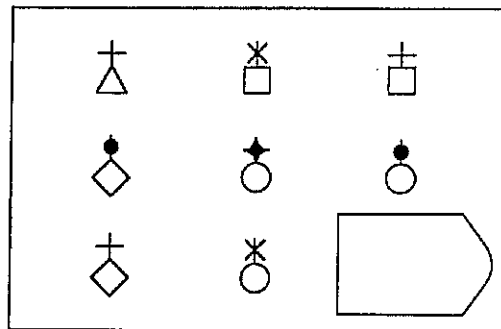


Answer: 4

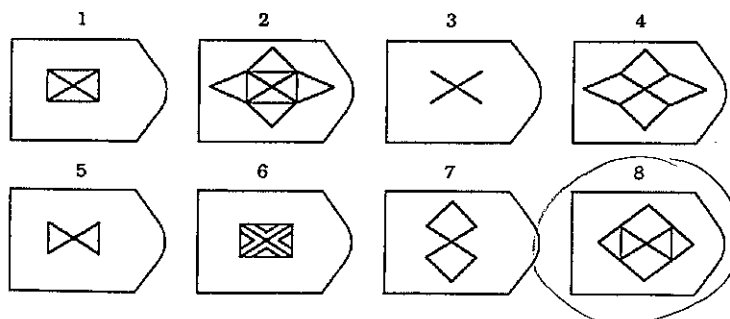
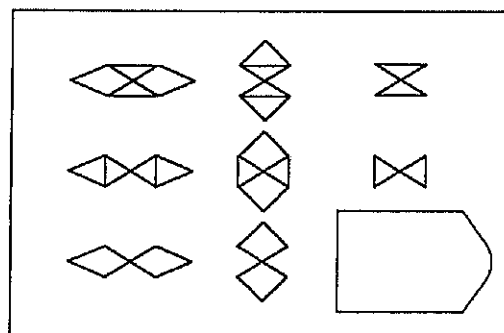
PLEASE CONTINUE ON NEXT PAGE

Please choose the image that best completes each of the following patterns.

PATTERN 1

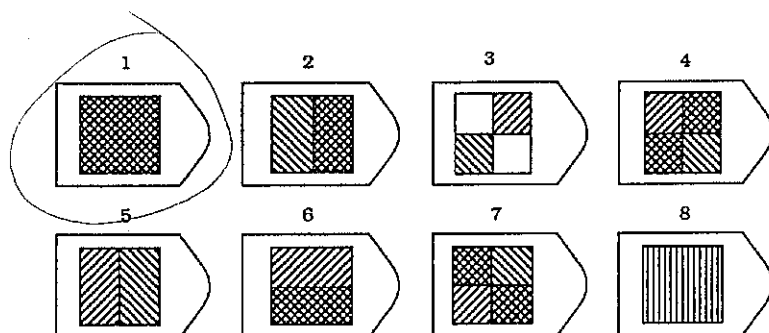
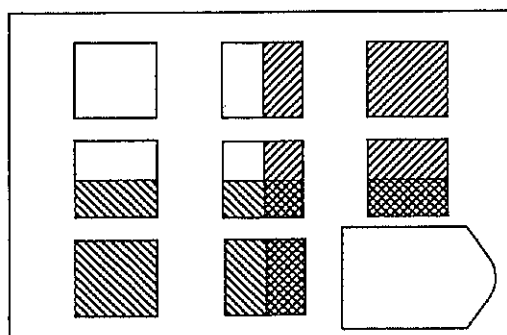


PATTERN 2

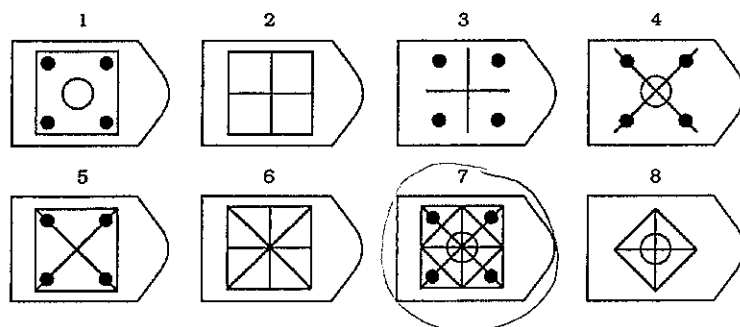
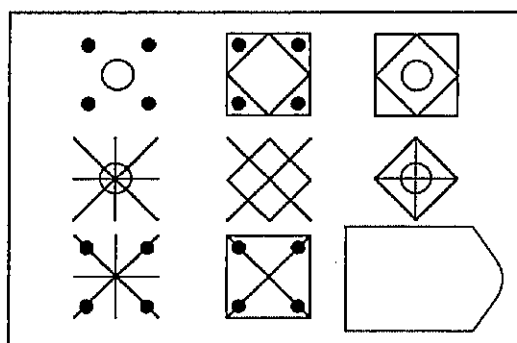


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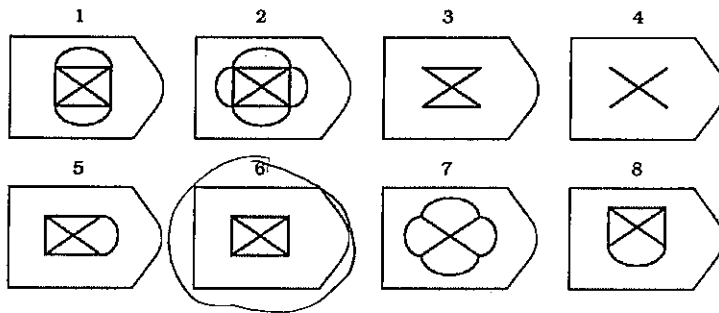
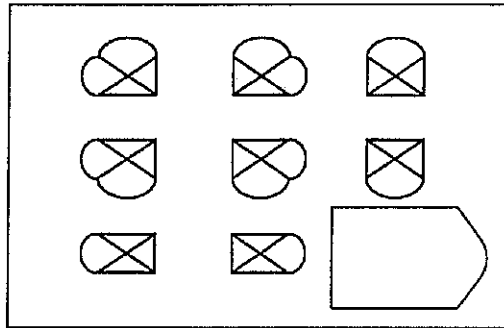
PATTERN 3



PATTERN 4



PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.
 - A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.
 - ☒ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
 - C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
 - D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.
 - A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
 - B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
 - C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
 - ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.
 - ☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
 - B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
 - C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
 - D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.
 - A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
 - B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
 - ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
 - D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...
- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
 - B. A leaf in the air. They are similar because they both move through the air carried by the wind.
 - C. Blowing bubbles. They are similar because they both float until they eventually pop.
 - D. A cloud in the sky. They are similar because they both float and are carried by the wind.
2. Catching a cold is like...
- A. Getting the flu. They are similar because they are both caused by viruses.
 - B. Getting pink eye. They are similar because they are both contagious.
 - C. Getting the flu. They are similar because they are both caused by not washing your hands.
 - D. Forgetting to do your homework. They are similar because they are both preventable.
 - ☒ E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 48822

What is your gender?

☐ Male

☒ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☒ Caucasian

☐ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A 3911 2932

GROUP: C29

Version B

99

MULTIPLE-CHOICE. 5 points each (50 points total).

- D
1. Which of the following would be considered a negative feedback to increasing global temperature?
- ☒ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - ☒ b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☐ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
- B
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - ☒ b. Gas bubbles forming in the magma
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
- C
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- ☒ a. A= erosion, B= deposition, C= uplift and erosion
 - b. A = erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - ☒ d. A = dissolution, B= deposition, C= uplift and deposition
- B
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - ☒ b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
- B
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.
- A
6. Which of the following would cause the acidity of Earth's oceans to decrease?
- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - ☒ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☒ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
- ✓

7. A reservoir is 1000 km³ in size, has an influx of 100 km³/year and an outflow of 50 km³/year. Which of the following statements is true?

- B
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.

$$\frac{1000}{100} = 10$$

$$\frac{1000}{50} = 20$$

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- B
- a. The Earth's atmosphere would become colder than it is today.
 - ☒ b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- A
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ~~b. Reflection of more solar radiation, causing atmospheric temperature to increase~~
 - ~~c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase~~
 - ~~d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease~~

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- B
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
- ✓

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

- a. Ocean acidification is a process where carbon dioxide and water form together to create bicarbonate ions. These hydrogen ions are what causes a pH level in water. pH is just a way to measure acidity.
- b. An increase in atmospheric CO_2 affects ocean acidification in two ways, which ironically are counterproductive. The first way is the increase in CO_2 in the atmosphere will increase the amount of carbon dioxide in oceans. Through the process of acidification the pH levels will rise in the ocean because of the increased input of CO_2 in the ocean. The ocean reservoir of CO_2 will have an increased resident time as well. Ironically the second affect is an increase in CO_2 in the atmosphere yields more heat; energy being absorbed by oceans, increasing sea temperature. The warmer the oceans the smaller amount of CO_2 it can hold, lowering the pH levels. Therefore it makes it ~~difficult~~ to predict exactly what the true effect an increase in atmospheric CO_2 will have on ocean acidification.

24

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

Volcanoes that erupt large ash clouds into the atmosphere have a major affect on atmospheric temperatures. The ash blocks the visible light, (energy from the sun) from reaching the Earth surface. If this energy does not reach the surface it cannot be converted into infrared heat which would normally be reemitted into the atmosphere until it is absorbed by greenhouse gases or it escaped back into the atmosphere. If the IR is absorbed by greenhouse gases it is reemitted in all directions heating the atmosphere. The gas essentially act like a blanket for the Earth. However if sunlight, or visible light is decreased by the volcanic ash this natural heating process will slow and decrease the overall atmospheric temperature.

25

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

They both are liquid forms that become gas forms, although evaporation is H_2O and degassing is CO_2 .

Earn up to 1 additional point on your course grade

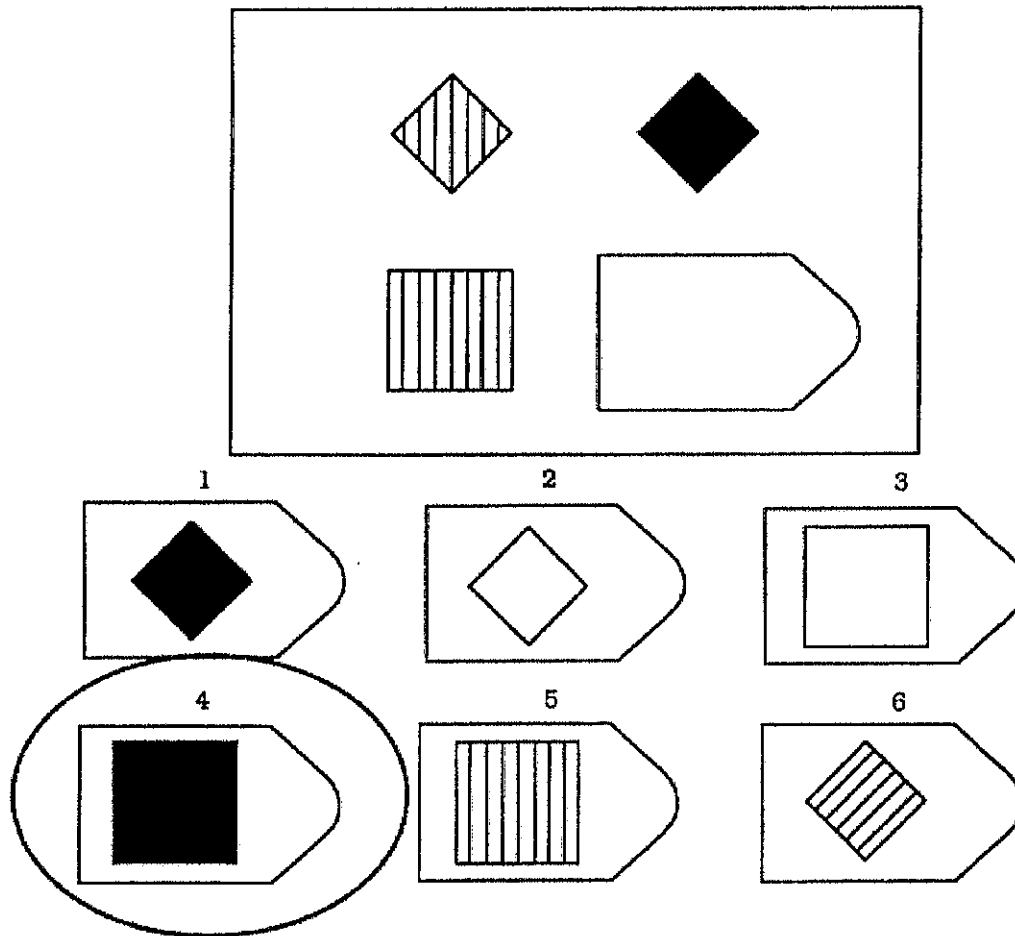
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

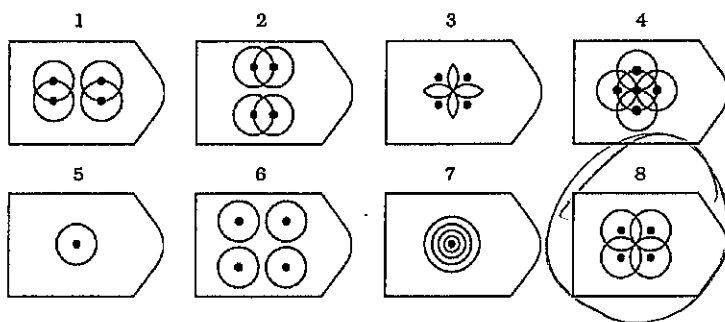
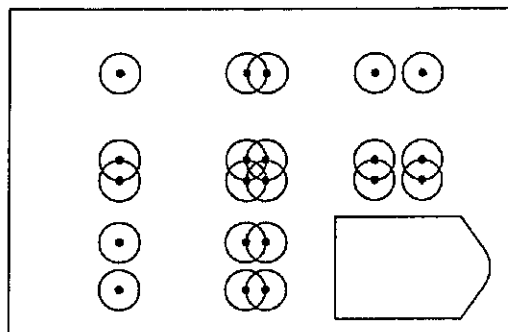


Answer: 4

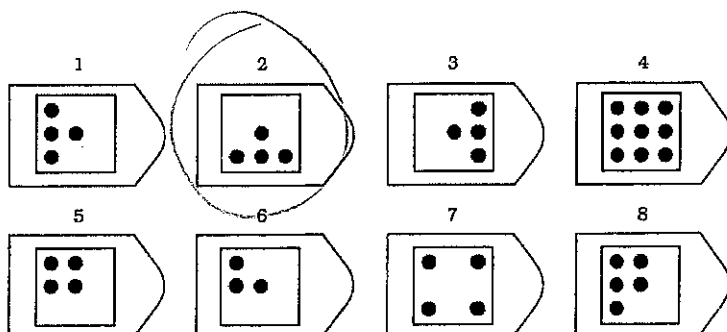
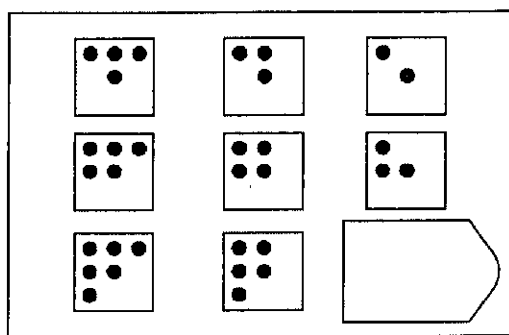
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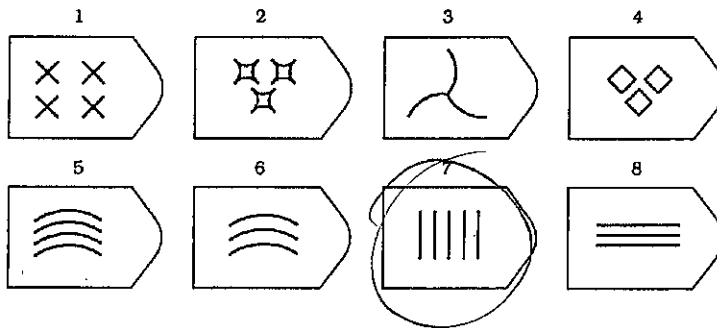
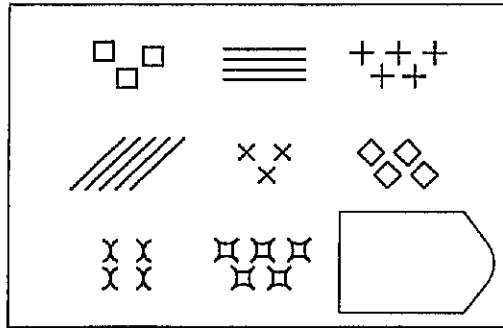
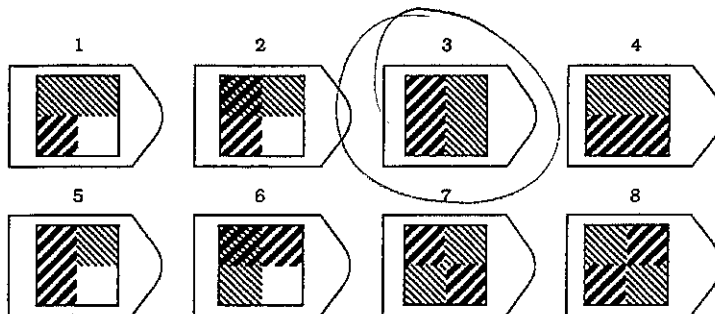
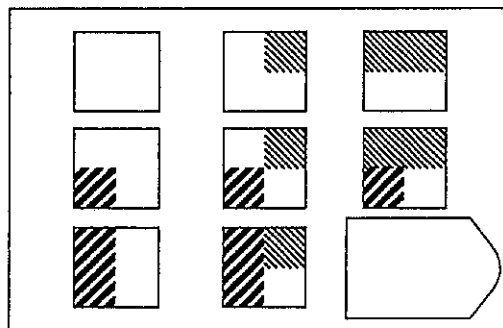
Please choose the image that best completes each of the following patterns.

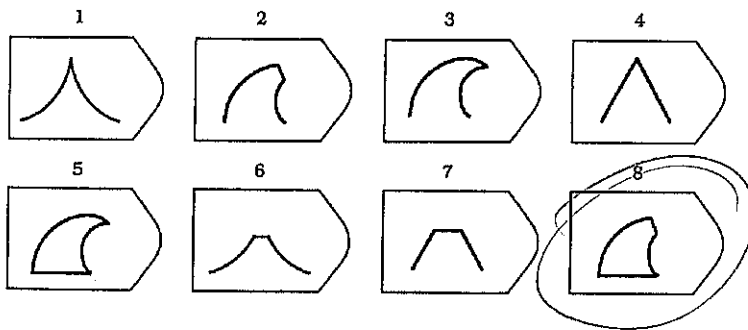
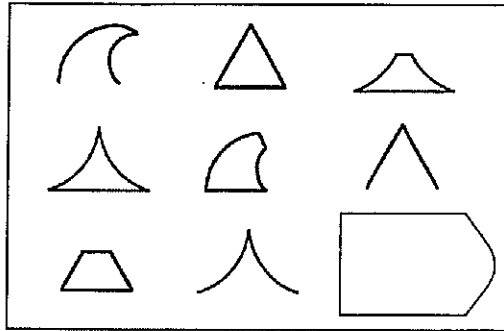
PATTERN 1



PATTERN 2



PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- ☒ A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☐ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- ☐ C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- ☐ D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- ☐ B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- ☐ C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- ☐ D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- ☐ A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- ☐ B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- ☒ C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- ☐ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- ☒ A. After eating a big lunch, Dan went back to his office and took a nap.
- ☐ B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- ☐ C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- ☐ D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
 - B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
 - C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
 - ☒ D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- ☒ C. Being sleep deprived. They both involve impaired functions.
- D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- A. Dew forming. They are similar because they both involve a drop in temperature.
- ☒ B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 49201

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A42515239

GROUP: _____

Version B

C29

* came to review session today.
MULTIPLE-CHOICE. 5 points each (50 points total).

- C 1. Which of the following would be considered a negative feedback to increasing global temperature?
- a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - c. An increase in evaporation and cloud formation resulting in the release of latent heat *More clouds, more sunlight blockage, Temp ↓*
 - d. An increase in desert formation resulting in more dusting blowing into the atmosphere
- B 2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- a. The magma becoming colder
 - b. Gas bubbles forming in the magma *makes magma less dense*
 - c. The surrounding crust becoming hotter
 - d. Crystals forming in the magma
- A 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- a. A= erosion, B= deposition, C= uplift and erosion
 - b. A= erosion, B= biochemical precipitation, C= uplift and deposition
 - c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
 - d. A= dissolution, B= deposition, C= uplift and deposition
- A 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- a. Human activities are the primary cause of the greenhouse effect.
 - b. Natural processes are the primary cause of the greenhouse effect.
 - c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - e. The human and natural causes of the greenhouse effect are not understood.
- B 5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- a. Reservoir A has a shorter residence time than Reservoir B.
 - b. Reservoir B has a shorter residence time than Reservoir A.
 - c. Reservoir A and Reservoir B have equal residence times.
 - d. More information about Reservoir A and Reservoir B is needed.
- A 6. Which of the following would cause the acidity of Earth's oceans to decrease?
- a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- ☒ b. The reservoir is not in equilibrium.
- a. The reservoir will eventually disappear.
c. The reservoir is growing smaller.
d. The reservoir's residence time is 10 years.
8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
- b. The Earth's atmosphere would become warmer than it is today.
c. The Earth's atmosphere would remain about the same temperature as it is today.
d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- b. Reflection of more solar radiation, causing atmospheric temperature to increase
c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
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SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

With more carbon dioxide in the atmosphere more CO_2 will be entered into the oceans. This is a positive feedback loop. The increased CO_2 in the atmosphere caused an increase of CO_2 in oceans.

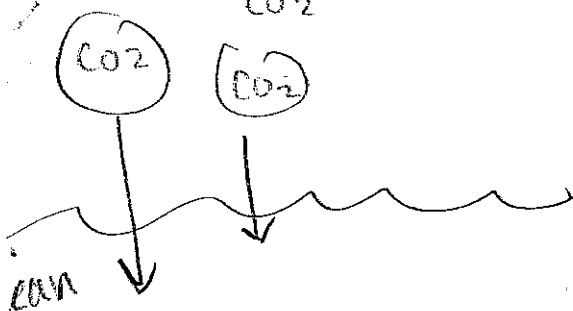
With more CO_2 in the atmosphere, the temperature will increase. Along with the increase of CO_2 in the ocean, more CO_2 will also exit the ocean because of warmer waters. This is an example of negative feedback loops. 7?

More CO_2 in the oceans will also make the oceans more acidic, yet warmer oceans have more degassing occurring, causing more CO_2 to be let out of oceans. This is another example of negative feedback loop because more CO_2 in the atmosphere causes warmer oceans, which causes more CO_2 to be released from oceans.

Atmosphere

CO_2

CO_2



22

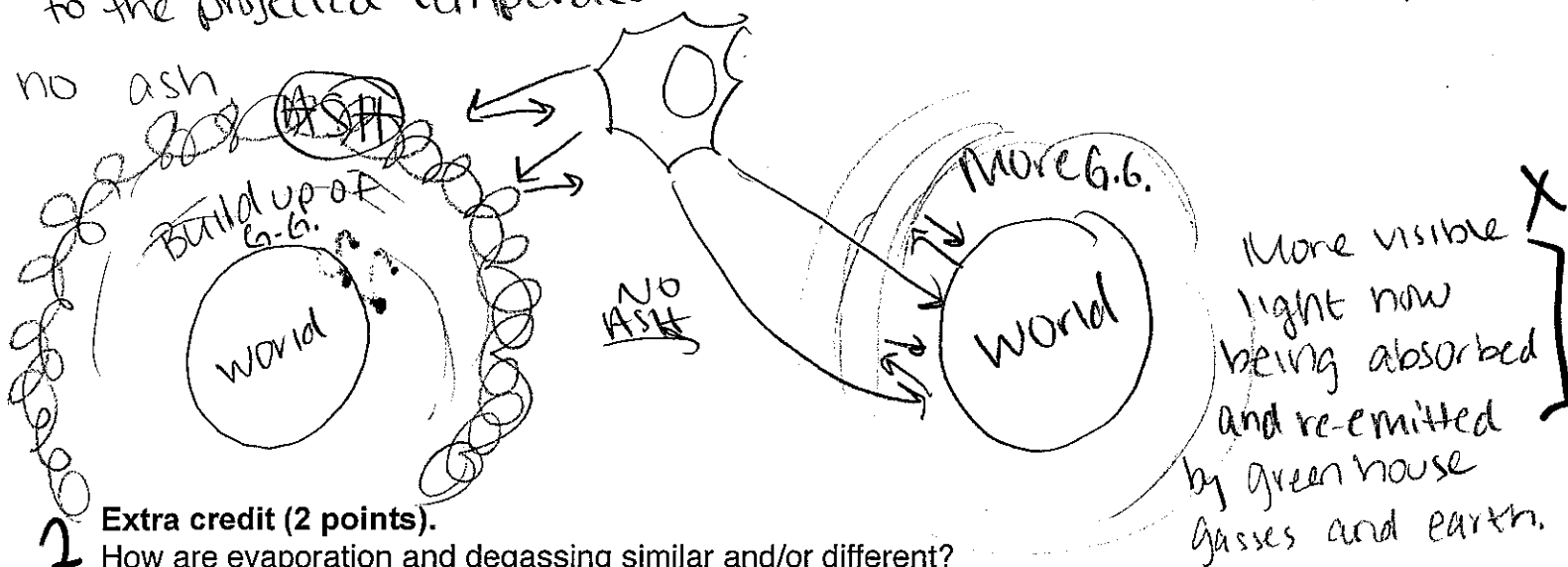
142515239

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

If volcanism suddenly increased one day, the amount of ash in the sky would increase. Say everyone goes on with their daily lives, emitting CO₂ and other greenhouse gasses, causing an increase. But because of the large amount of ash covering the sky, visible light would not be able to pass through the ash, causing a decrease in temperature. If suddenly one day the ash completely disappeared, the visible light would be able to finally get through. Because the amount of greenhouse gasses have been increasing over the time where the ash has been blocking sunlight, the temperature would increase exponentially to the projected temperature if there would have been



Extra credit (2 points).

2 How are evaporation and degassing similar and/or different?

Evaporation is liquid to gas in atmosphere.

Degassing moves gas in liquid to gas in atmosphere.

Earn up to 1 additional point on your course grade

[ex. a 79% becomes an 80%]

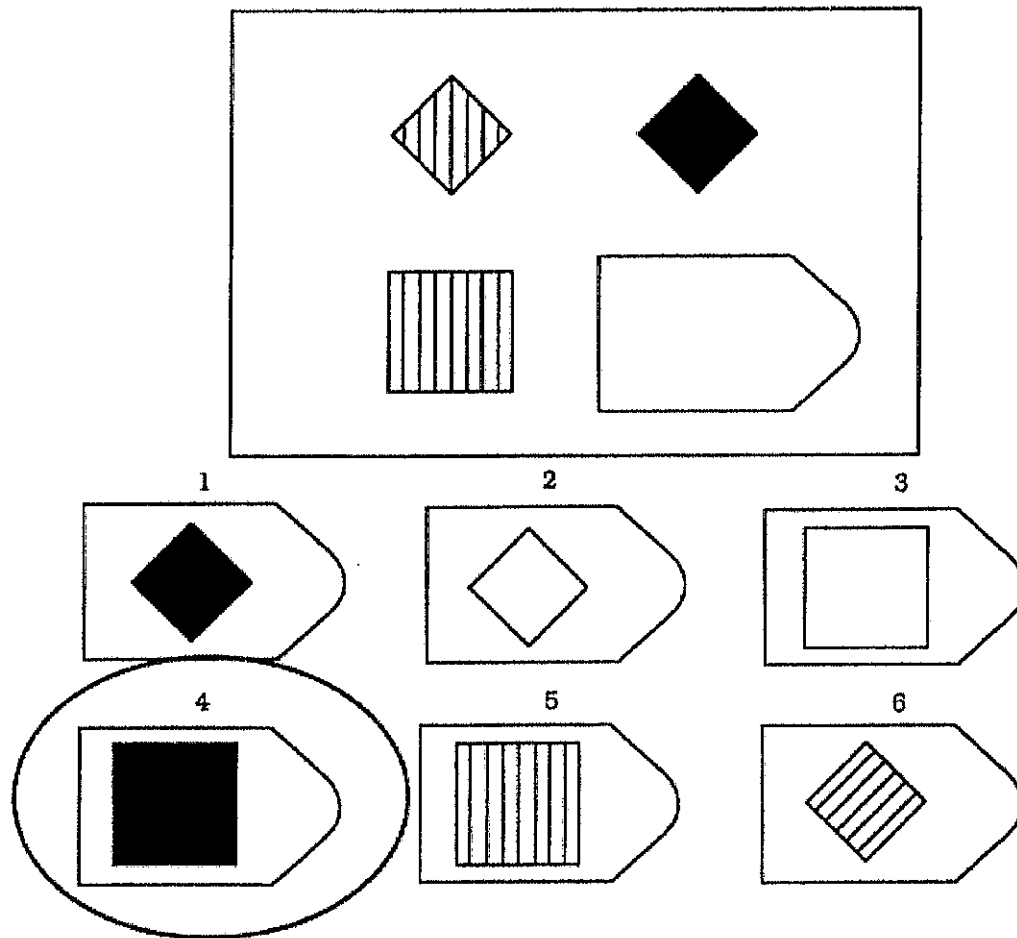
Thoughtfully complete the attached survey

AU2S1S239

Analogical Assessment

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Example

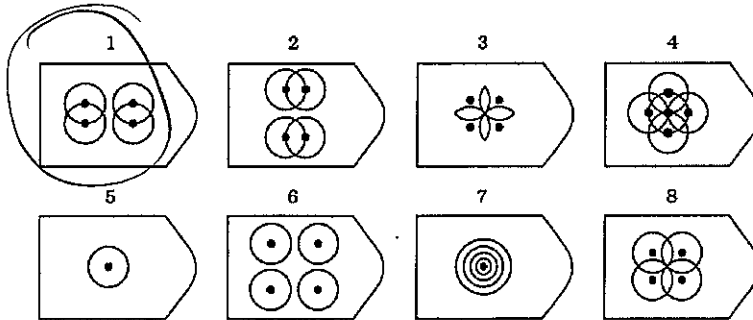
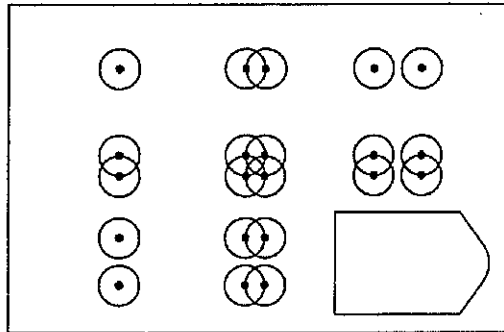


Answer: 4

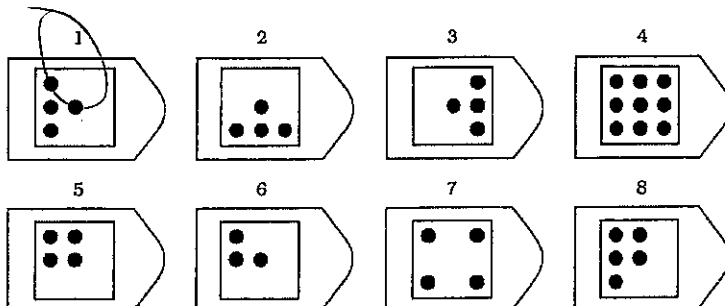
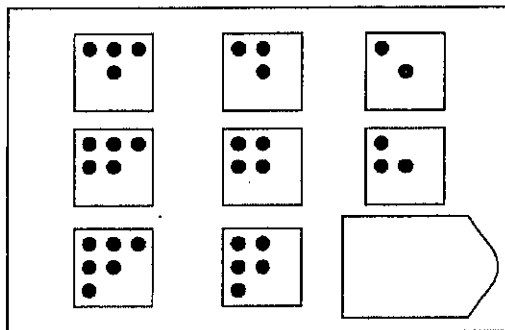
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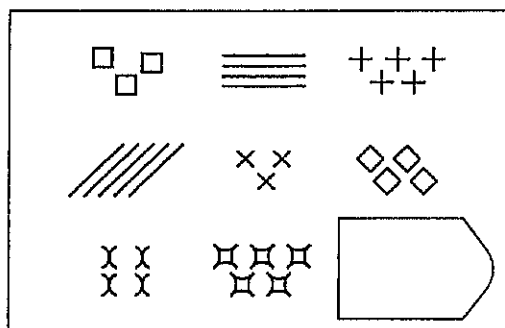
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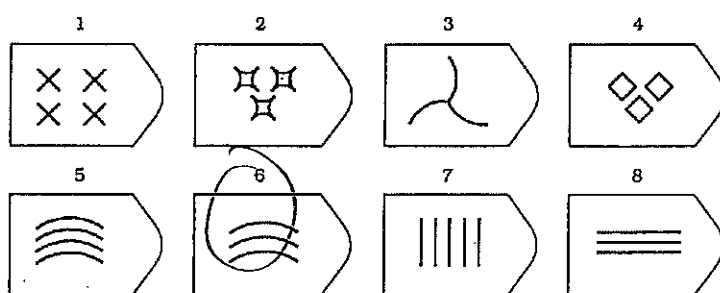
PATTERN 2



PATTERN 3

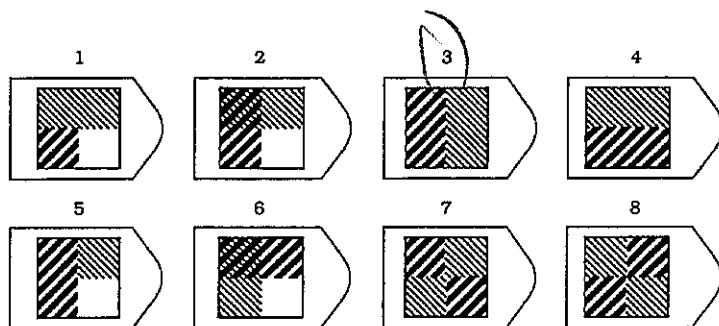
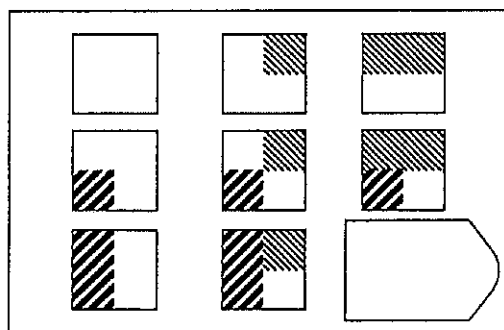


6



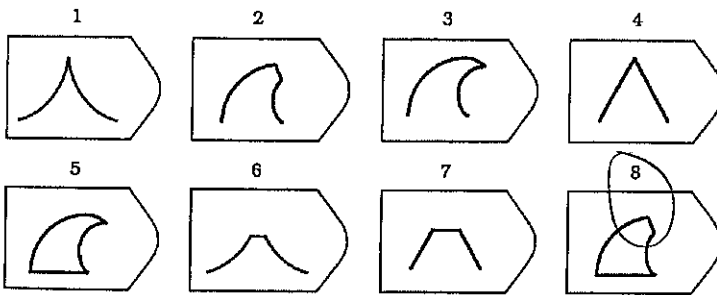
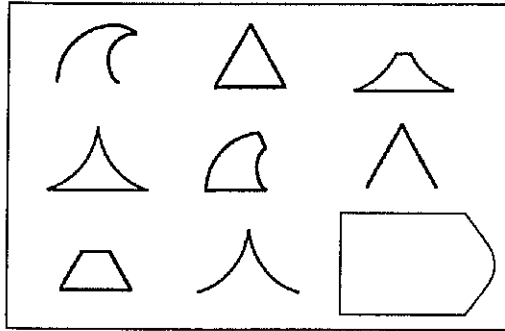
PATTERN 4

3



PATTERN 5

8



In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

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Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
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PLEASE CONTINUE ON NEXT PAGE

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- C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

☐ 4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- C ☐ A. After eating a big lunch, Dan went back to his office and took a nap.
- B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- ☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- C
- A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
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Please choose the response that is closest to an analogy that you might make.

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- ☒ A. Getting high. They are both involve too much of a chemical influencing the body.
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 - C. Being sleep deprived. They both involve impaired functions.
 - D. Eating too much candy. They both involve lack of self-control.
 - E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- C
- A. Dew forming. They are similar because they both involve a drop in temperature.
 - ☒ B. Blowing up a balloon. They are similar because they both involve becoming less dense.
 - ☒ C. Clouds forming. They are similar because they both involve a phase change.
 - D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48085

What is your gender?

- ☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
☒ Caucasian
☐ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A42672148
Version B

GROUP:

C29

73

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
b. Melting of permafrost resulting in more methane escaping into the atmosphere
C ☒ c. An increase in evaporation and cloud formation resulting in the release of latent heat
d. An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
a. The magma becoming colder
B ☒ b. Gas bubbles forming in the magma
c. The surrounding crust becoming hotter
d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
C ☐ a. A= erosion, B= deposition, C= uplift and erosion
☐ b. A = erosion, B= biochemical precipitation, C= uplift and deposition
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☐ d. A = dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
A ☒ a. Human activities are the primary cause of the greenhouse effect.
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☐ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
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5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
B ☒ a. Reservoir A has a shorter residence time than Reservoir B.
☐ b. Reservoir B has a shorter residence time than Reservoir A.
☐ c. Reservoir A and Reservoir B have equal residence times.
☐ d. More information about Reservoir A and Reservoir B is needed.
6. Which of the following would cause the acidity of Earth's oceans to decrease?
C ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
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☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

a. The reservoir will eventually disappear. \times

☒ b. The reservoir is not in equilibrium.

c. The reservoir is growing smaller. \times

d. The reservoir's residence time is 10 years.

$$\frac{1000}{100} = 10 \quad \frac{1000}{50} = 20$$

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

☒ a. The Earth's atmosphere would become colder than it is today.

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9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease

b. Reflection of more solar radiation, causing atmospheric temperature to increase

c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase

d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

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ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

3

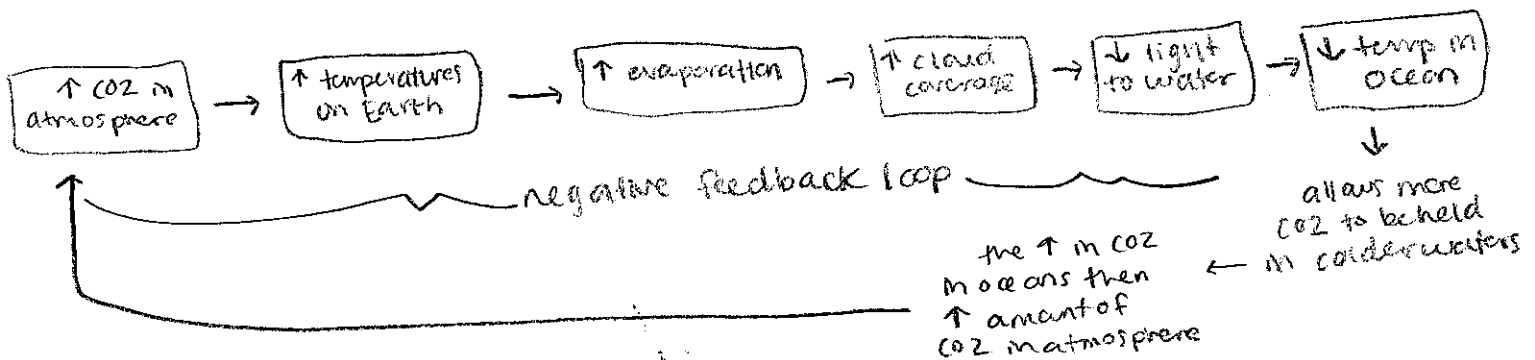
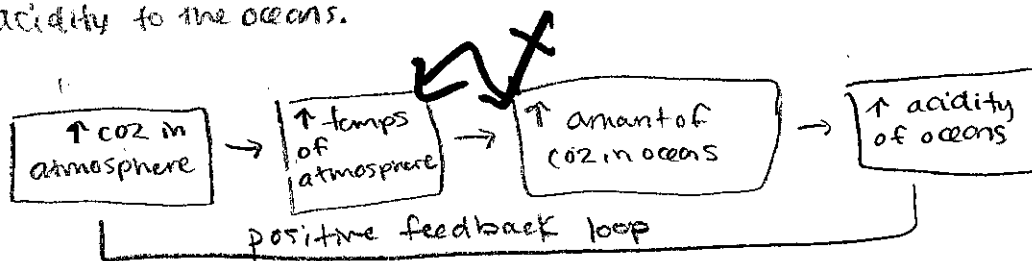
SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide would cause ocean acidification to rise. When CO_2 increases in the ocean it also increases in the oceans. the more CO_2 there is the oceans the more acidic the oceans are. $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$ represents when more CO_2 is added then more HCO_3^- will form which is an acid. So therefore the increase in CO_2 will add more acidity to the oceans.



18

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The greenhouse effect is when visible light radiated by the sun enters the Earth's atmosphere. The visible light is either absorbed or reflected back into space. The light absorbed by Earth is transformed into infrared energy and is reemitted by the Earth. The greenhouse gases absorb the infrared light or it gets reflected back to space. The light absorbed by the gases is then reemitted into the atmosphere warming it. The energy then continues to be absorbed and reemitted between the Earth and greenhouse gases.

The increase in volcanism would at first decrease temperatures because the cloud of volcanic ash would allow less radiation from the sun in causing less heat to warm the atmosphere. Once the cloud is gone then temperatures would sharply increase due to the increased CO₂ from volcanism and nothing to block the sun's radiation so there would be more heat in the atmosphere.

Increases in volcanism increase CO₂ which will increase temperatures. Increases in cloud coverage decrease temperatures because of the less amount of sunlight radiated into the atmosphere.

25

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

They are different because evaporation is from a liquid to a solid while degassing is from a solid to vapor. Similar because they both end in gaseous stages.

Earn up to 1 additional point on your course grade

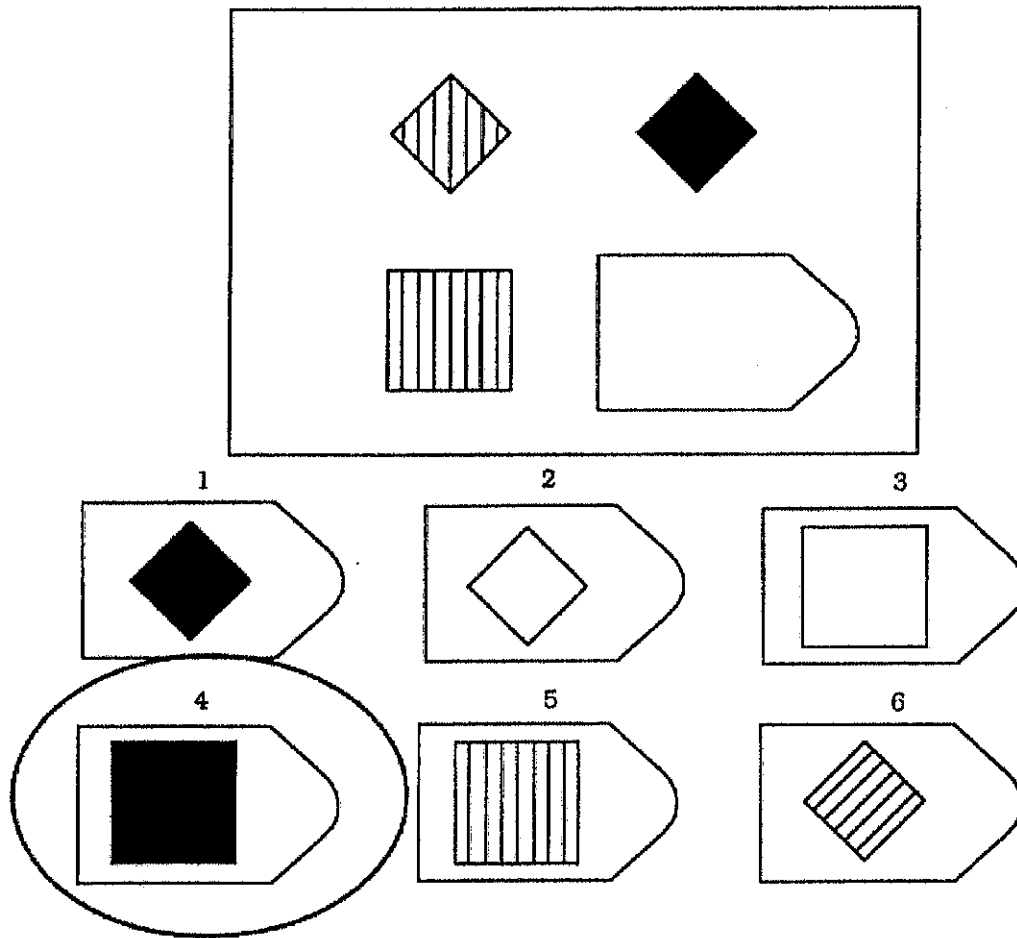
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

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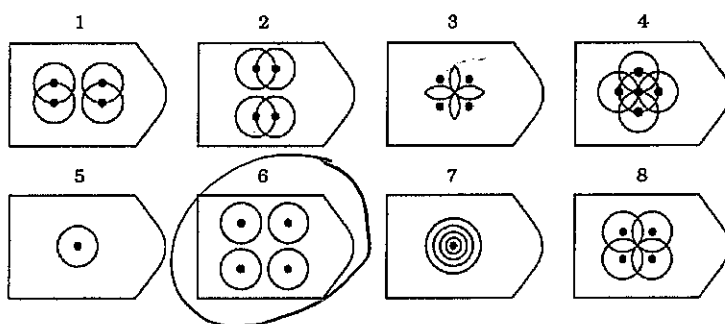
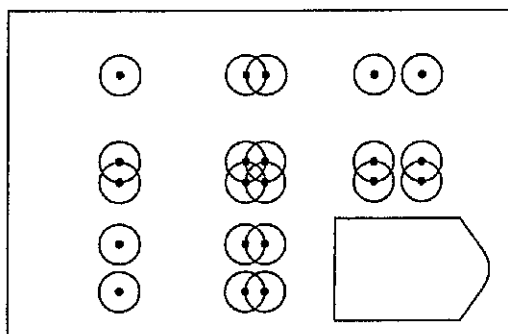


Answer: 4

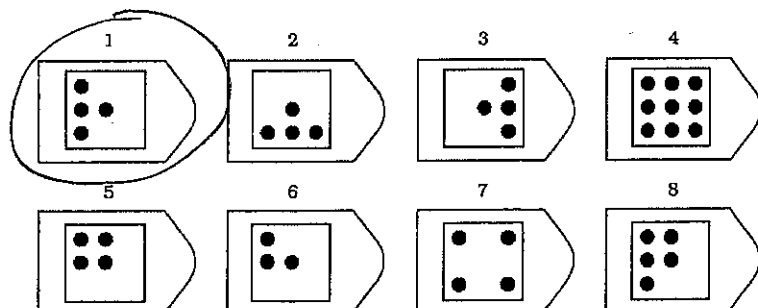
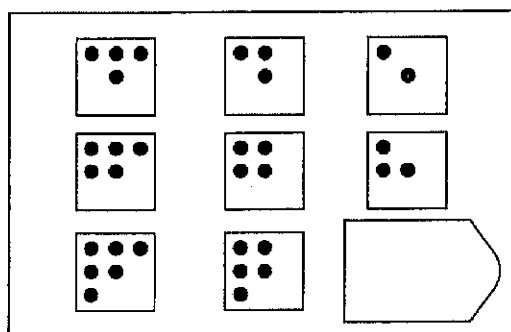
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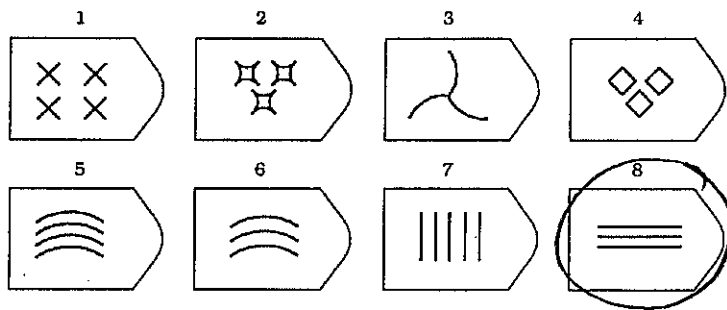
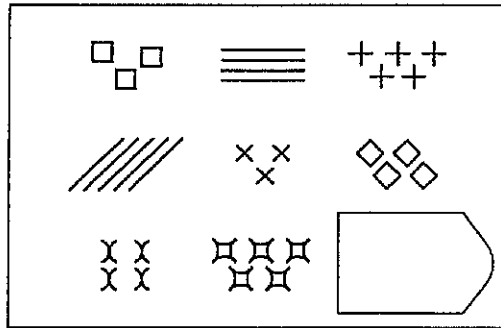
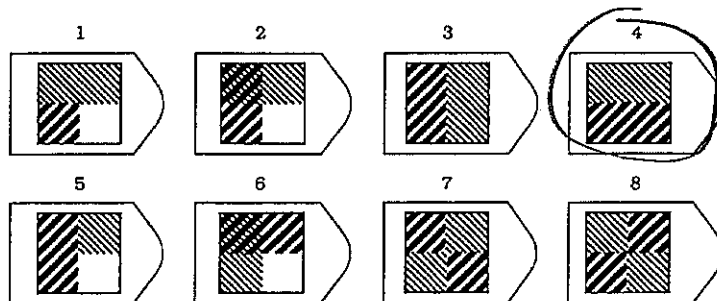
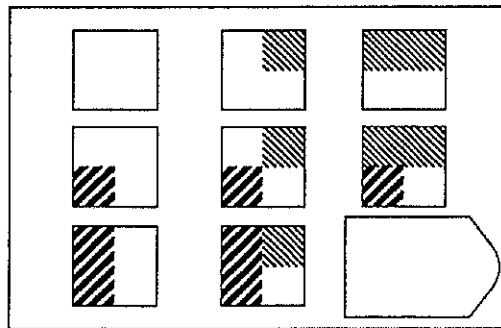
PATTERN 1

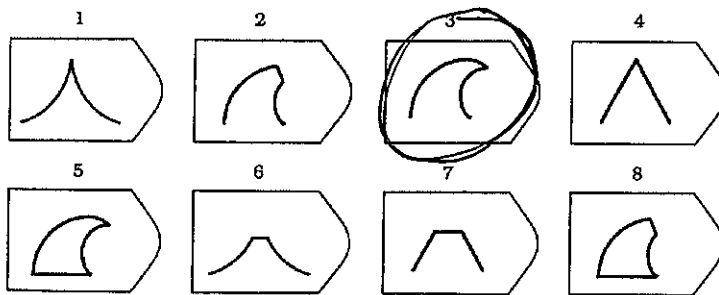
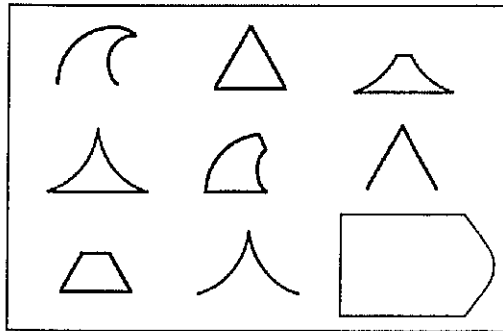


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

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Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

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What is your home zip code? 48085

What is your gender?

☐ Male

☒ Female

☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black

☒ Caucasian

☐ Latino/Hispanic

☐ Native Hawaiian/Pacific Islander

☐ Native American

☐ Other

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

1

STUDENT NAME: A43303247

GROUP: C29

Version B

70

MULTIPLE-CHOICE. 5 points each (50 points total).

- Which of the following would be considered a negative feedback to increasing global temperature?
 - ☐ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed $\downarrow \text{ice} = \uparrow \text{temp}$
 - ☐ b. Melting of permafrost resulting in more methane escaping into the atmosphere $\uparrow \text{temp} = \uparrow \text{melt} = \uparrow \text{CH}_4 = \uparrow \text{temp}$
 - ☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat $\uparrow \text{temp} = \uparrow \text{evap} = \uparrow \text{latent heat} = \uparrow \text{temp}$
 - ☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere $\uparrow \text{dust} = \uparrow \text{sun block} = \downarrow \text{temp}$
- Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
 - ☐ a. The magma becoming colder
 - ☒ b. Gas bubbles forming in the magma (\uparrow escape of $\text{CO}_2 \rightarrow \downarrow$ density)
 - ☐ c. The surrounding crust becoming hotter
 - ☐ d. Crystals forming in the magma
- Fill in the blanks. Calcium atoms ^{$\text{Ca}^{2+} \rightarrow \text{Ca}^{2+}$ (solution)} in a limestone at Earth's surface become calcium atoms in solution through the process of dissolution ^A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of biochemical precipitation and compaction ^B, and then limestone becomes exposed at Earth's surface through the processes of uplift and erosion ^C.
 - ☐ a. A = erosion, B = deposition, C = uplift and erosion
 - ☐ b. A = erosion, B = biochemical precipitation, C = uplift and deposition
 - ☒ c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
 - ☐ d. A = dissolution, B = deposition, C = uplift and deposition
- Which of the following statements about the greenhouse effect on Earth is most accurate? ^{or GW}
 - ☐ a. Human activities are the primary cause of the greenhouse effect. industrial revolution
 - ☒ b. Natural processes are the primary cause of the greenhouse effect.
 - ☐ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - ☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - ☐ e. The human and natural causes of the greenhouse effect are not understood.
- Imagine two CO_2 reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO_2 influx and CO_2 outflow are equal. Which reservoir has the shorter residence time?
 - ☐ a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A. $\frac{2}{1} \quad \frac{1}{1} \quad A+B \text{ are equal}$
 - ☐ c. Reservoir A and Reservoir B have equal residence times. $2 \quad 1 \quad + \text{both have equal inflow + outflow}$
 - ☐ d. More information about Reservoir A and Reservoir B is needed.
- Which of the following would cause the acidity of Earth's oceans to decrease?
 - ☐ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide. $\uparrow \text{CO}_2$
 - ☐ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash. $\downarrow \text{CO}_2 = \downarrow \text{temp}$
 - ☒ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun. $\downarrow \text{solar} = \downarrow \text{heat}$

[A]

$\downarrow \text{heat}$

[B]

$\downarrow \text{ocean temp}$

$\downarrow \text{solar} = \downarrow \text{heat}$

$\uparrow \text{atmos temp} = \uparrow \text{CO}_2 = \uparrow \text{ocean CO}_2 = \uparrow \text{acidity}$

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- a. The reservoir will eventually disappear.
b. The reservoir is not in equilibrium.
c. The reservoir is growing smaller.
d. The reservoir's residence time is 10 years.

$$\frac{1000 \text{ km}^3}{100 - 50 \text{ km}^3/\text{yr}} = \frac{1000}{50} = 20 \text{ years}$$

\rightarrow 2x as much question

8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- a. The Earth's atmosphere would become colder than it is today.
b. The Earth's atmosphere would become warmer than it is today.
c. The Earth's atmosphere would remain about the same temperature as it is today.
d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

$\downarrow \text{Gas} = \downarrow \text{temp}$

9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
b. Reflection of more solar radiation, causing atmospheric temperature to increase
c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

$\downarrow \text{temp} = \uparrow \text{glaciers} = \uparrow \text{reflected light}$

reflected decreases heat in atmosphere

10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

$$\uparrow \text{temp} = \uparrow \text{evap} = \uparrow \text{clouds} = \downarrow \text{temp}$$

$$\uparrow \text{temp} = \uparrow \text{evaporation} = \uparrow \text{clouds} = \downarrow \text{radiation} = \downarrow \text{temp}$$

neg. feedback

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

$\uparrow \text{atmos CO}_2 = \uparrow \text{atmos temp} = \uparrow \text{CO}_2 \text{ in oceans} = \uparrow \text{ocean Ph} = \uparrow \text{acid.}$

A) The equation $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$ means that when CO_2 is added to water (atmospheric CO_2 entering oceans) Bicarbonate and hydrogen ions are created. These ions increase the pH (acidity) of the oceans, thus ocean acidification increases. In this case with an increase in atmospheric carbon dioxide, which is a greenhouse gas and thus traps the IR heat from solar radiation, the atmospheric temperature will increase. With an increase in atmospheric temperature comes an increase in the amount of CO_2 entering the oceans. As the amount of CO_2 increases the oceans become more acidic and ocean acidification will increase.

B) positive feedback - an initial change brings about further change in the same direction. As atmos. CO_2 increases, atmospheric temperature increases due to the greenhouse effect. As the atmospheric temperature increases so do the processes which release more CO_2 into the atmosphere. With these processes more CO_2 enters the oceans and its acidity increases. The increase in acidity increases the CO_2 in organisms (CaCO_3) which through degassing and evaporation increase atmospheric CO_2 which comes back to the beginning of the cycle thus intensifying the effect.

- Neg feedback - change in opposite direction which brings the system closer to equilibrium. An increase in atmospheric CO_2 increases the temp which increases evaporation which increases clouds which decreases temp which decreases CO_2 production.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

$\uparrow \text{volcanism} = \uparrow \text{ash} = \downarrow \text{sunlight in} = \downarrow \text{temp}$

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

A) As volcanoes erupt they force ash clouds into the atmosphere. These ash clouds block incoming solar radiation from the sun. If radiation is blocked then the IR heat rays would not be able to enter our atmosphere. ~~IR~~ rays are important due to the greenhouse effect. with this effect incoming solar radiation (mostly visible light) has short enough wavelength that is able to pass through earth's atmosphere and reach earth's surface. Some is absorbed by clouds (which is why the heat would be stopped and temperature would decrease due to the ash). The light which reaches the surface reflects? and is either lost to space or reemitted into the atmosphere. In the atmosphere the IR (heat) may be radiated to space or blocked by greenhouse gasses. The IR blocked by the gasses is either lost or reemitted back to earth's surface where the process begins again. **mixed up**

B) an increase in anything blocking incoming solar radiation results in a decrease in atmospheric temperature. An increase in greenhouse gasses emitted at earth's surface results in some heat being trapped on earth thus increasing temperature.

15

2 Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation involves the change of molecules from liquid to gaseous form. Degassing involves the release of a gas from its medium. Both can involve phase changes. Evaporation only can be from liquid to gas while degassing is just the release of gas and can be from a liquid or solid. Both play a role in the earth's cycle of information from one reservoir

Earn up to 1 additional point on your course grade

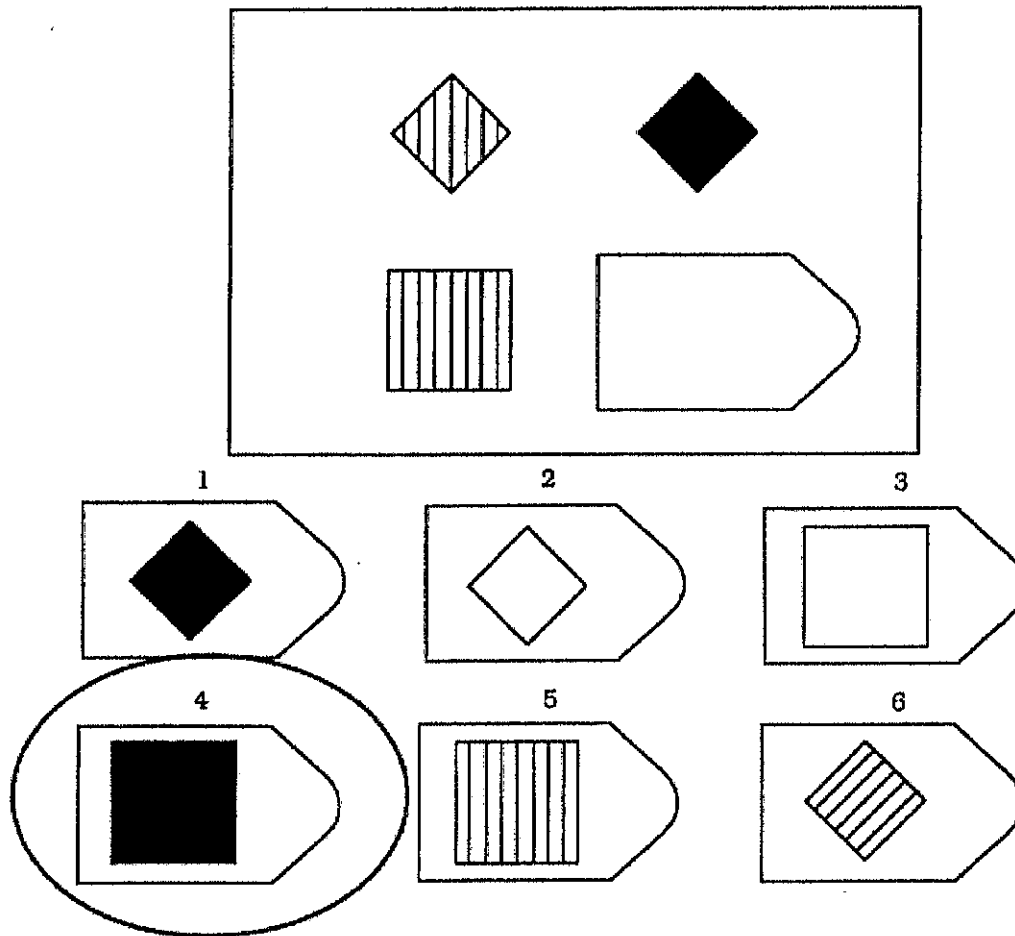
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

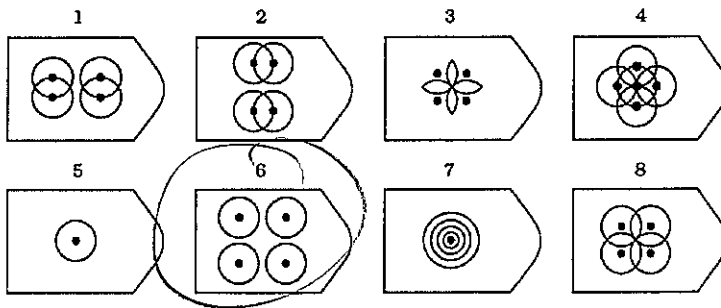
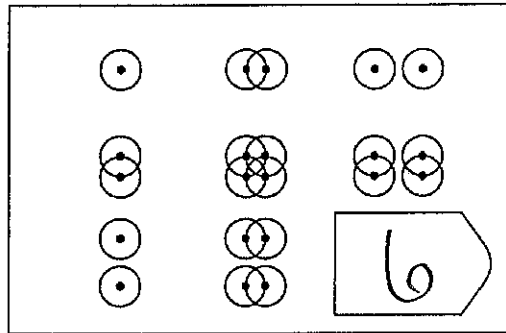


Answer: 4

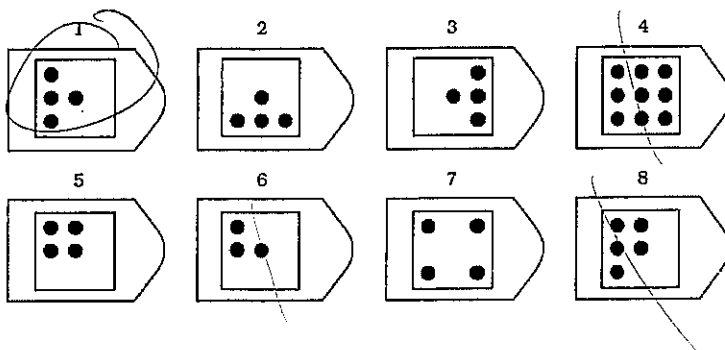
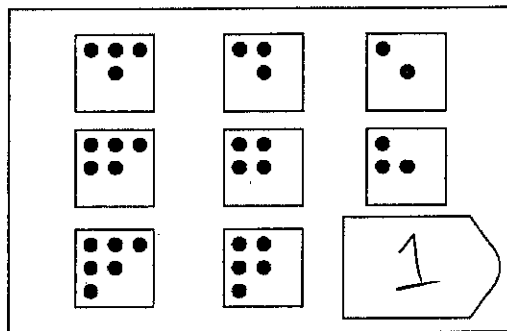
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Please choose the image that best completes each of the following patterns.

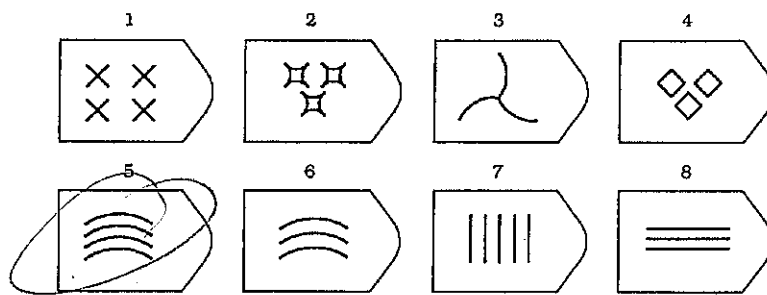
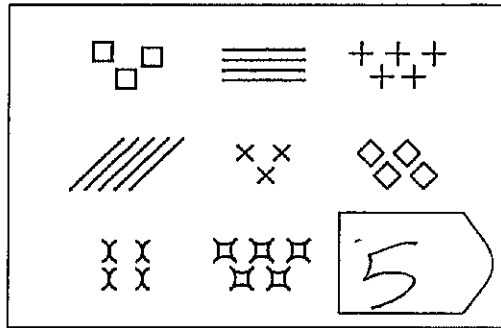
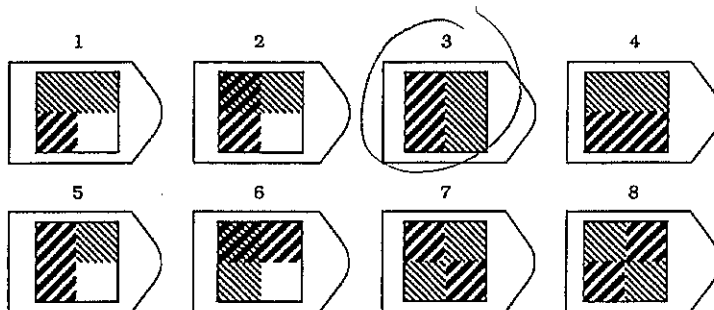
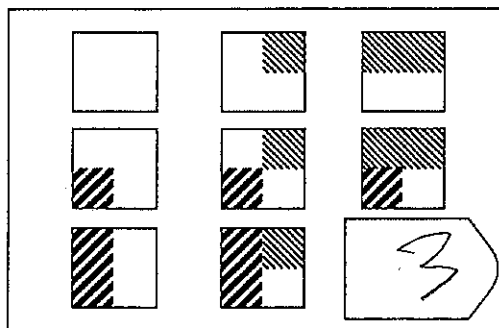
PATTERN 1

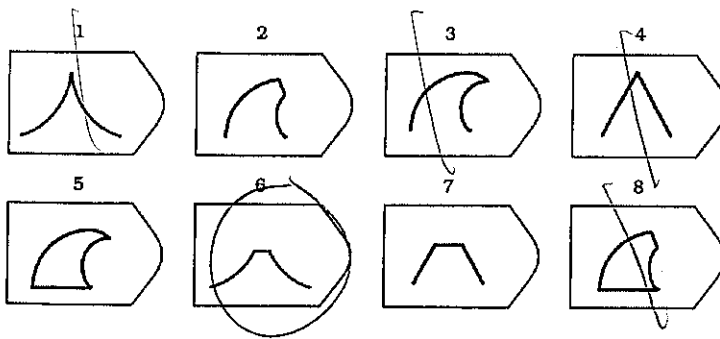
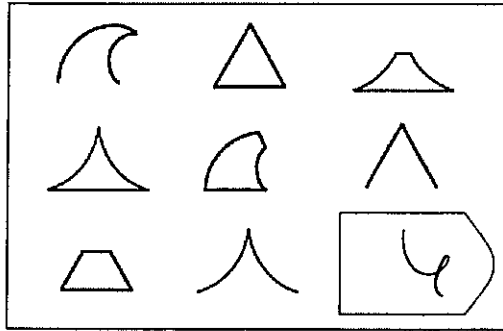


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- ☒ B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- A. After eating a big lunch, Dan went back to his office and took a nap.
- B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- ☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- ☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
- B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
- C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
- D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- A. Getting high. They are both involve too much of a chemical influencing the body.
- B. Hitting your head. They both involve something that causes headaches.
- C. Being sleep deprived. They both involve impaired functions.
- ☒ D. Eating too much candy. They both involve lack of self-control.
- E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- ☒ A. Dew forming. They are similar because they both involve a drop in temperature.
- B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- C. Clouds forming. They are similar because they both involve a phase change.
- D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 18 years

What is your home zip code? 48917

What is your gender?

- ☐ Male
- ☒ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

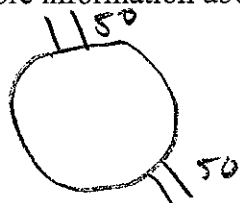
STUDENT NAME: A43425519
Version A

GROUP: C30

33

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
 - ☐ a. The magma becoming colder
 - ☒ b. Gas bubbles forming in the magma
 - ☐ c. The surrounding crust becoming hotter
 - ☐ d. Crystals forming in the magma
2. Which of the following would be considered a negative feedback to increasing global temperature?
 - ☐ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed *positive*
 - ☒ b. Melting of permafrost resulting in more methane escaping into the atmosphere
 - ☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat
 - ☐ d. An increase in desert formation resulting in more dusting blowing into the atmosphere
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
 - ☐ a. A = erosion, B = deposition, C = uplift and erosion
 - ☐ b. A = erosion, B = biochemical precipitation, C = uplift and deposition
 - ☒ c. A = dissolution, B = biochemical precipitation, C = uplift and erosion
 - ☐ d. A = dissolution, B = deposition, C = uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
 - ☐ a. Human activities are the primary cause of the greenhouse effect.
 - ☐ b. Natural processes are the primary cause of the greenhouse effect.
 - ☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - ☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
 - ☐ e. The human and natural causes of the greenhouse effect are not understood.
5. Which of the following would cause the acidity of Earth's oceans to decrease?
 - ☐ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - ☒ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
 - ☐ a. Reservoir A has a shorter residence time than Reservoir B.
 - ☒ b. Reservoir B has a shorter residence time than Reservoir A.
 - ☐ c. Reservoir A and Reservoir B have equal residence times.
 - ☐ d. More information about Reservoir A and Reservoir B is needed.



shorter residence time

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?
- ~~a.~~ The reservoir will eventually disappear.
- ☒ b. The reservoir is not in equilibrium.
- ~~c.~~ The reservoir is growing smaller.
- ~~d.~~ The reservoir's residence time is 10 years.
- $\frac{1000}{50} = 20$
8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- ~~b.~~ Reflection of more solar radiation, causing atmospheric temperature to increase
- ~~c.~~ Re-emitting of more infrared radiation, causing atmospheric temperature to increase
- ~~d.~~ Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- ~~a.~~ Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
- ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
- ~~c.~~ Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
- ~~d.~~ More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.
10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
- ~~b.~~ The Earth's atmosphere would become warmer than it is today.
- ~~c.~~ The Earth's atmosphere would remain about the same temperature as it is today.
- ~~d.~~ The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.

SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

1

- The increase in atmospheric carbon dioxide would greatly affect ocean acidification because the carbon dioxide in the ocean kills many animals as well as coral. The carbon dioxide in the atmosphere would precipitate more carbon dioxide into the ocean. The ocean would then become more polluted with carbon dioxide. As the cycle continues, the ocean water would evaporate, condense, then precipitate back into the ocean (when it condenses the water becomes polluted with more carbon dioxide). This then causes the concentration of carbon dioxide to be higher.
 - Through this process of the water becoming more concentrated with carbon dioxide, the carbon dioxide and the water bond together to form a hydrogen ion and hydrocarbonate. This makes the water more diluted. Also the water becomes less dense due to the exchange.
 - The positive feedback loop consists of the processes of the carbon dioxide precipitating into the oceans, then the water from the oceans evaporate. (This leaving the oceans more diluted) Then once the water evaporates it goes into the atmosphere becomes diluted and condenses in the clouds and begins to precipitate.
- Also cause the density of the ocean to decrease and become less dense.
- Negative feedback loops the carbon dioxide combines with the water and precipitates into the ocean. Then the carbon dioxide and water are evaporated and condensed, the carbon dioxide then either precipitates or is evaporated when the water condenses.

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

The eruption of the volcanoes would affect earth's atmospheric temperature in a few ways. The eruption of the volcanoes forms a large cloud of ash which would rise up into the atmosphere. The ash would then seem as a shield to the sun's ^{solar radiation} heat (rays) trying to get through the atmosphere. The ^{solar radiation} heat (rays) that gets through (small amount) the atmosphere then go to the earth's surface. Once it hits the earth's surface, it is then reflected back up to the atmosphere but ~~cannot~~ escape. This would then cause the temperature to increase. Also carbon dioxide? would not be able to leave the atmosphere, causing a higher concentration of carbon dioxide. I forgot to mention the methane coming from the sun through the atmosphere which would get trapped inside the atmosphere, causing the earth to be heated, due to the greenhouse gas effect.

- The ash cloud acts as a shield, but lets little solar radiation in through the atmosphere. The radiation then reflects off the earth's surface, trying to escape back into the atmosphere, but the ash cloud doesn't allow it out.
- The increase in greenhouse gases (carbon dioxide, methane) will cause the earth to increase temperature. The ash lets some solar radiation from the sun through and then traps them inside the atmosphere causing earth's temperature to increase.

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation and degassing are similar because as water evaporates it has cycles. The are also forms of gas. When degassing they are trying to purify causing no more acid. They are both a natural way of purification.

Earn up to 1 additional point on your course grade

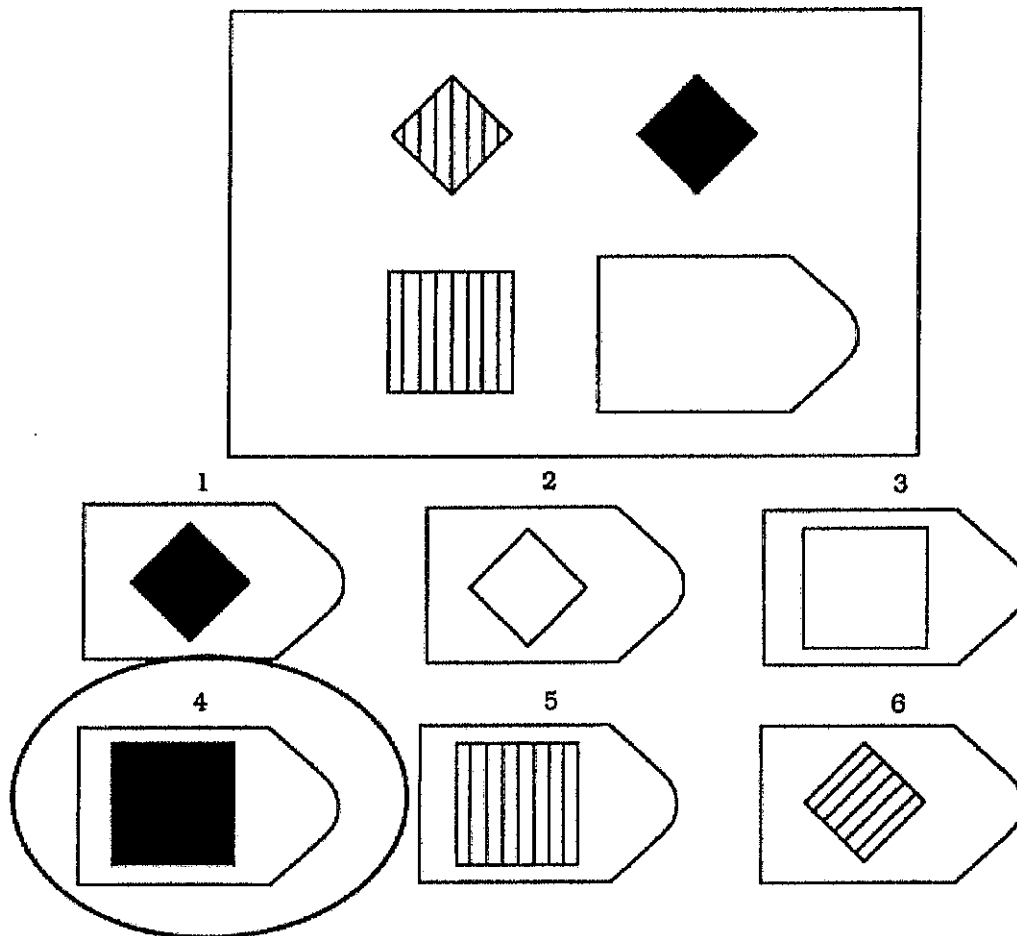
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

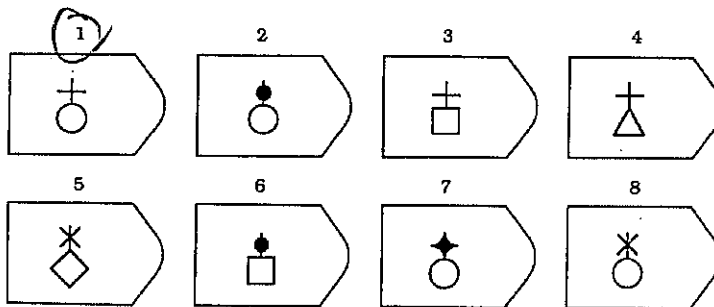
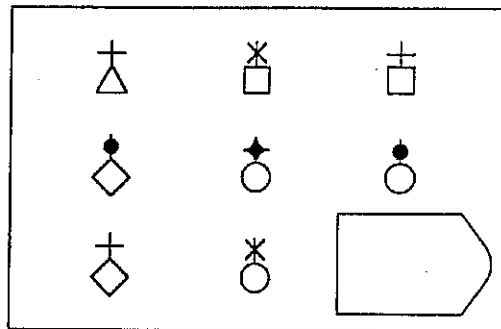


Answer: 4

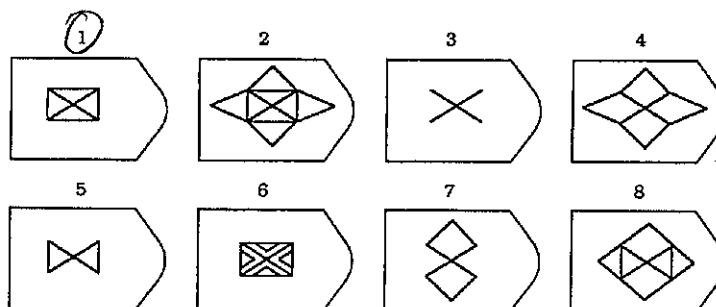
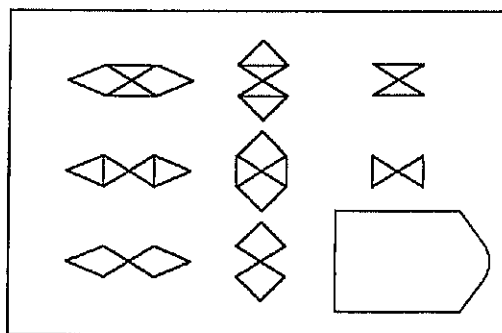
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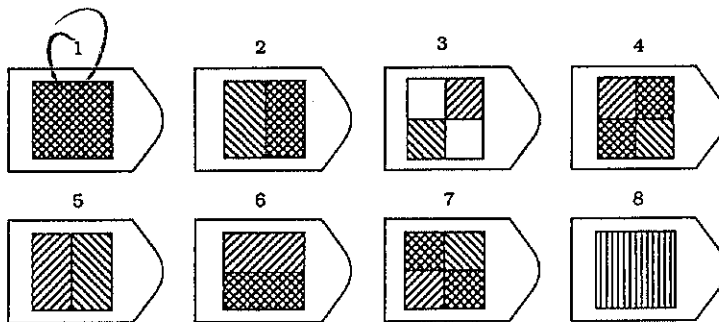
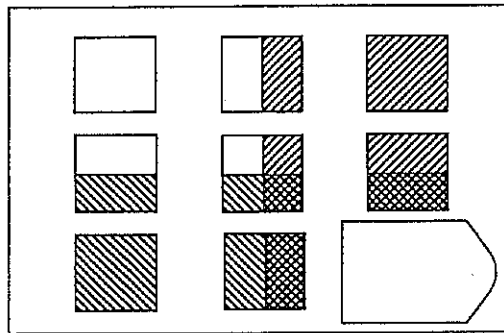
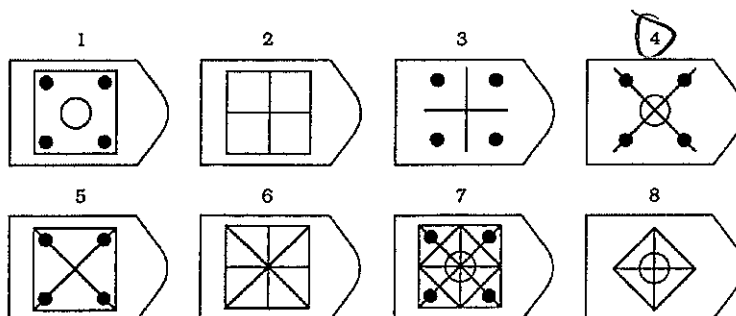
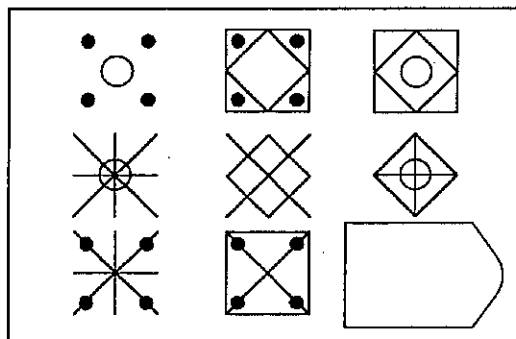
Please choose the image that best completes each of the following patterns.

PATTERN 1

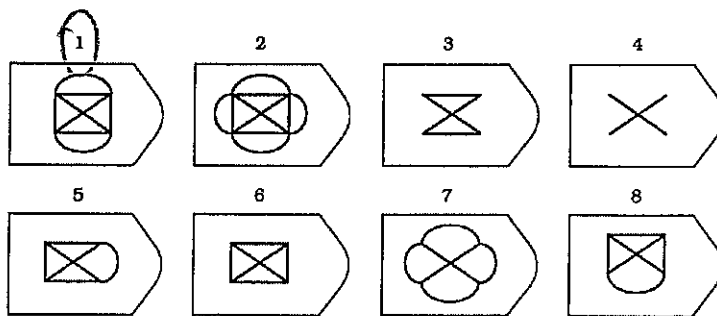
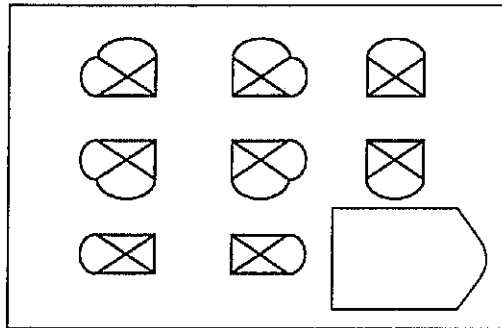


PATTERN 2



PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

- ☒ A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.
- ☐ B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.
- C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.
- D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

- A. Before the annual parade, the city council decided to renovate one of the buildings downtown.
- B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.
- C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.
- ☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

- ☒ A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.
- B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.
- C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.
- D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

- A. The toddler wrote on the walls with pens when the babysitter wasn't looking.
- B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.
- ☒ C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.
- D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - ☒ C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- B. A leaf in the air. They are similar because they both move through the air carried by the wind.
- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- ☒ A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 48371

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other

STUDENT NAME: A41387561
Version A

GROUP: C30

83

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?

- ☐ a. The magma becoming colder
☒ b. Gas bubbles forming in the magma
☐ c. The surrounding crust becoming hotter
☐ d. Crystals forming in the magma

2. Which of the following would be considered a negative feedback to increasing global temperature?

- ☐ a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
☐ b. Melting of permafrost resulting in more methane escaping into the atmosphere
☐ c. An increase in evaporation and cloud formation resulting in the release of latent heat
☒ d. An increase in desert formation resulting in more dusting blowing into the atmosphere

3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.

- ☒ a. A= erosion, B= deposition, C= uplift and erosion
☐ b. A = erosion, B= biochemical precipitation, C= uplift and deposition
☐ c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
☐ d. A = dissolution, B= deposition, C= uplift and deposition

4. Which of the following statements about the greenhouse effect on Earth is most accurate?

- ☐ a. Human activities are the primary cause of the greenhouse effect.
☐ b. Natural processes are the primary cause of the greenhouse effect.
☒ c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
☐ d. Neither human activities nor natural processes are important causes of the greenhouse effect.
☐ e. The human and natural causes of the greenhouse effect are not understood.

5. Which of the following would cause the acidity of Earth's oceans to decrease?

- ☒ a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
☐ b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
☐ c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?

- ☐ a. Reservoir A has a shorter residence time than Reservoir B.
☒ b. Reservoir B has a shorter residence time than Reservoir A.
☐ c. Reservoir A and Reservoir B have equal residence times.
☐ d. More information about Reservoir A and Reservoir B is needed.



ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of 100 km/year and an outflow of 50 km/year . Which of the following statements is true?

- a. The reservoir will eventually disappear.
b. The reservoir is not in equilibrium.
c. The reservoir is growing smaller.
d. The reservoir's residence time is 10 years.

$$\frac{1000}{50} = 2000$$

8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
b. Reflection of more solar radiation, causing atmospheric temperature to increase
c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

10. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?

- a. The Earth's atmosphere would become colder than it is today.
b. The Earth's atmosphere would become warmer than it is today.
c. The Earth's atmosphere would remain about the same temperature as it is today.
d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.



SHORT ANSWER. 25 points each (50 points total)

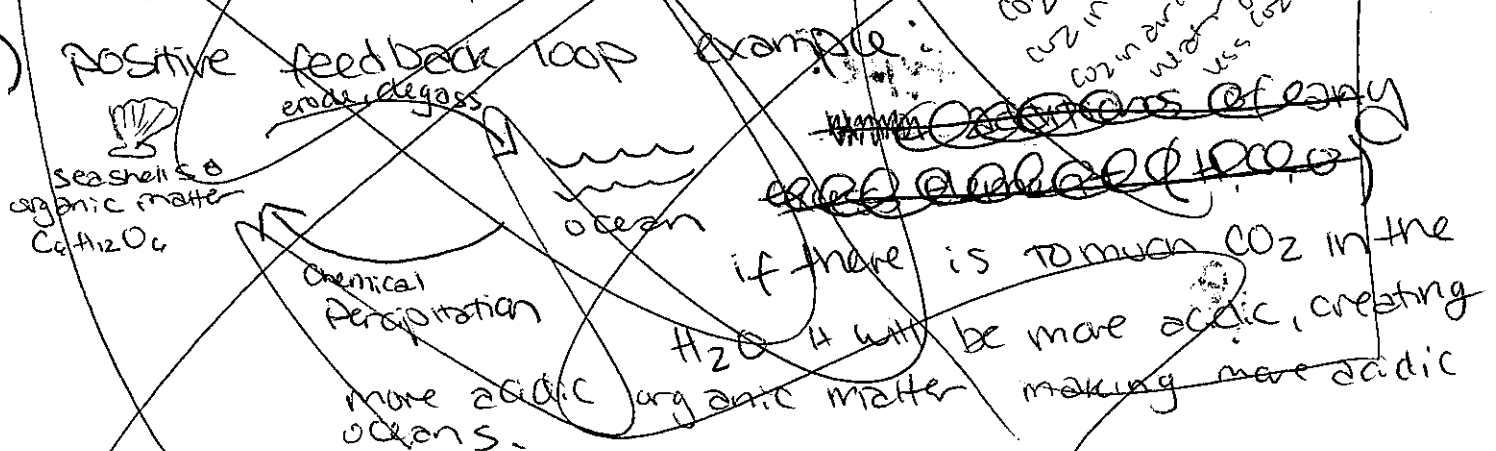
1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

25

a) Ocean acidification is the H^+ levels in the ocean. Carbon dioxide and water will combine ~~as a gas~~ to create the acidity. It will also form sea shells & other organic materials in the form of $\text{C}_6\text{H}_{12}\text{O}_6$. These organic materials may also degas & erode to put more acidity back in the oceans. Carbon, oxygen & hydrogen are the 3 elements involved in acidity. They can also come from the atmosphere because atmosphere must be at equilibrium w/ ocean.



negative feedback loop.

Sorry Re-done on survey cover page

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

a) green house effect: the sun radiates heat & light to earth. visible light is not absorbed by earth but infrared is. the infrared is then radiated by the earth into the atmosphere. in the atmosphere it is trapped by particles in the atmosphere. the particles then vibrate w/ energy & radiate energy back into atmosphere in all directions.

more ash in the atmosphere would mean more particles in the air.

- b) the more particles in the air will effect the atmospheric pressure in 2 ways
- 1) more particles will block sun rays from entering atmosphere causing cooling
 - 2) more particles ^{type?} will trap in more heat using the green house gas effect causing warming

13

X Extra credit (2 points).

How are evaporation and degassing similar and/or different?

they both take chemicals from a solid ^{liquid} ~~organs~~ & make it into a gas.

A41387 521

Question

1

a) ocean acidification is when too much H^+ is in the ocean
Carbon dioxide mixes with the gas in the ocean

H_2O (liquid) + CO_2 (gas) when the two bonds link a chemical change occurs creating HCO_3^- and H^+ (gas)

ocean acidity effects the growth of organic matter
the H^+ yielded from $H_2O + CO_2$ is used to create $C_6H_{12}O_6$.

when the organic material degasses it will yield H^+ back into the ocean.

Earn up to 1 additional point on your course grade

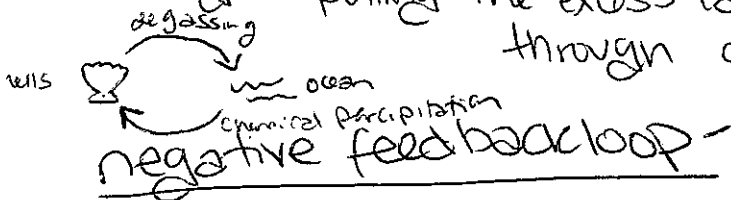
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

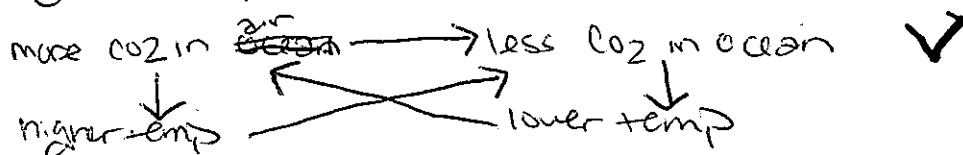
b) positive feed back loop-

if there is too much CO_2 in the ocean it will effect organic matter.

too much $C_6H_{12}O_6$ Calcium Carbonate will be created because of the increased ocean acidity. shells will be lumpy & disfigured & have an abnormal chemical composition. these abnormal shells will soon erode & degas putting the excess calcium carbonate into the oceans through chemical precipitation.



if too much CO_2 is put into the air then to be at equilibrium more CO_2 will go into the ocean. However if too much CO_2 is put into the atmosphere global warming will occur. ~~it's harder for~~ CO_2 ~~passes~~ CO_2 ~~passes~~ to dissolve in the ocean at higher temps so less CO_2 will go back into the air.



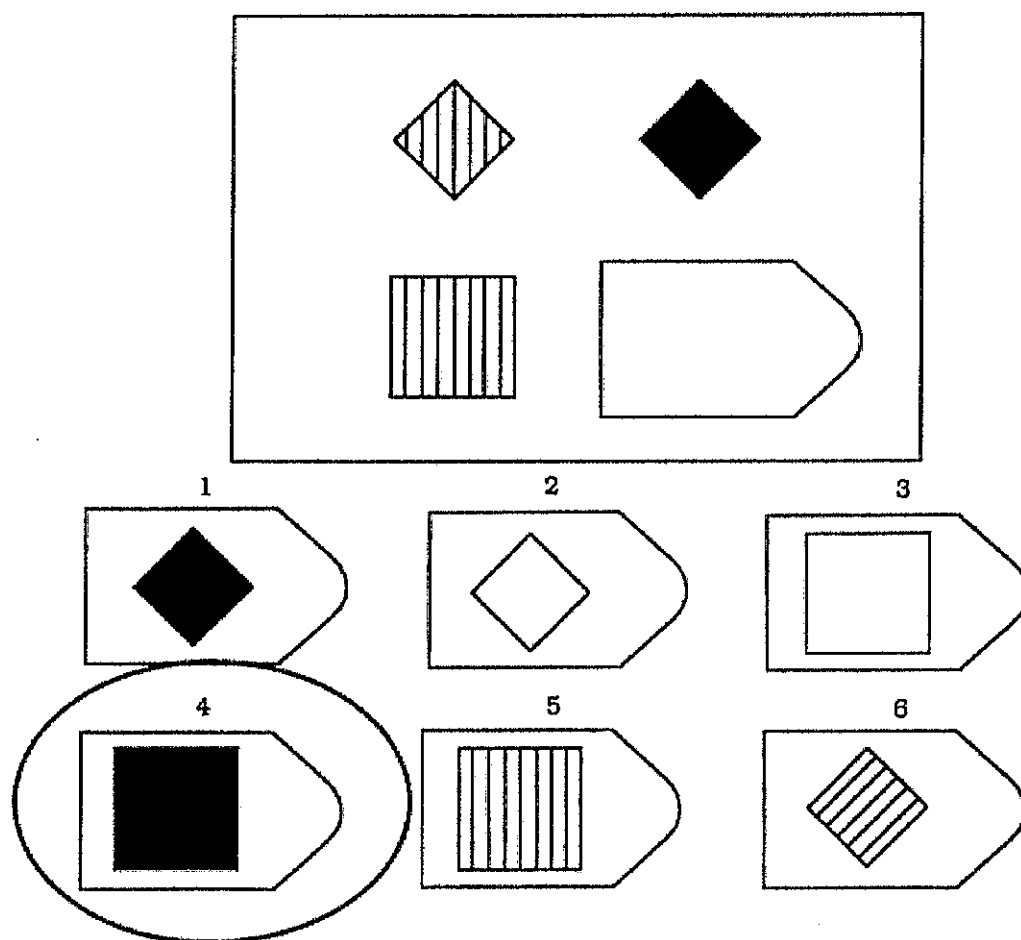
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✓

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

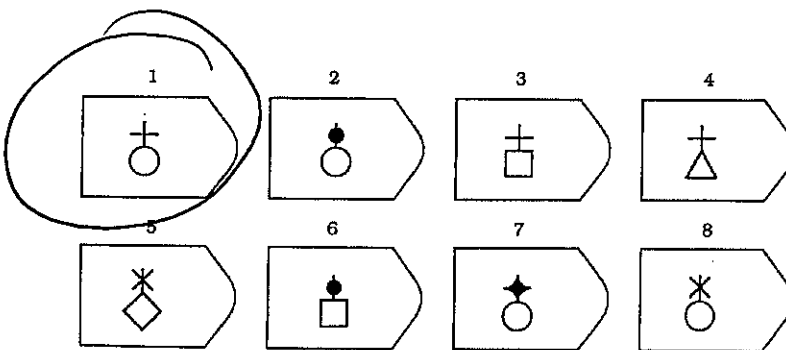
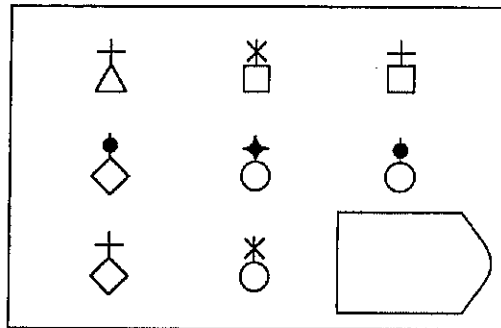


Answer: 4

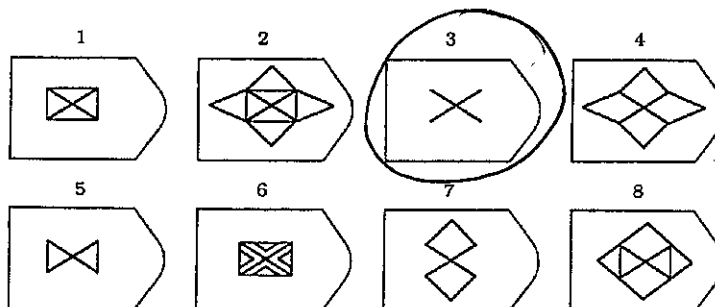
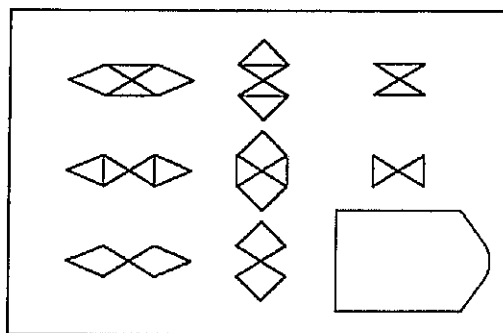
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Please choose the image that best completes each of the following patterns.

PATTERN 1

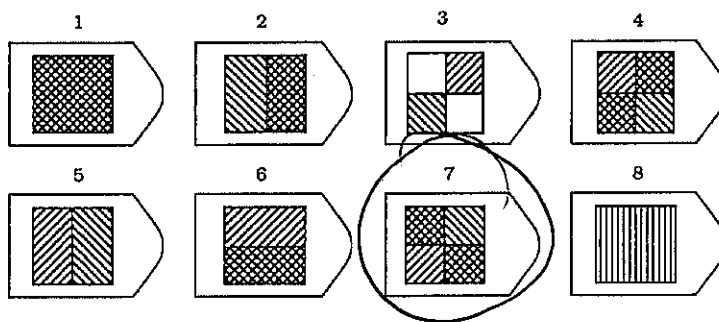
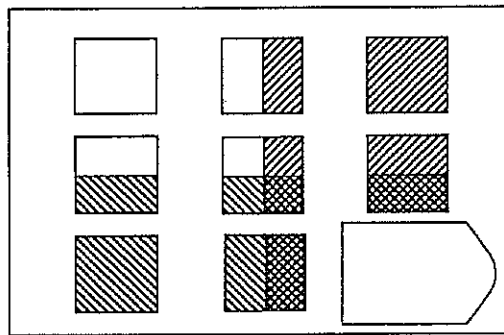


PATTERN 2

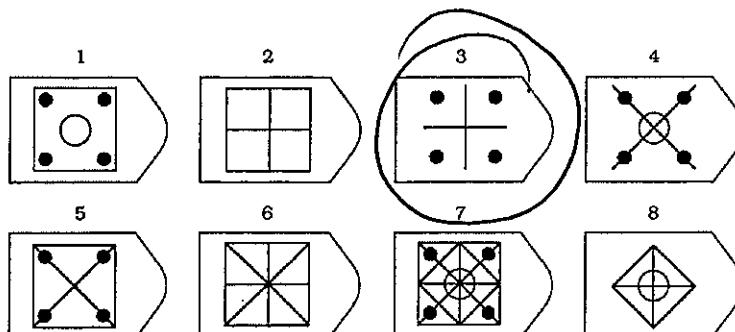
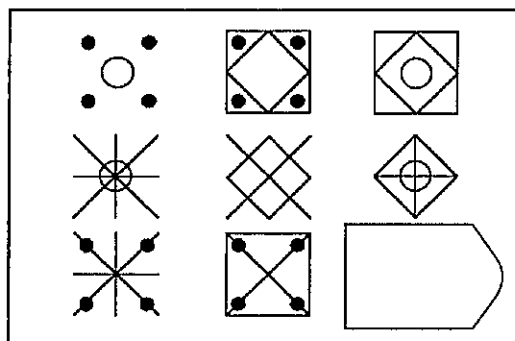


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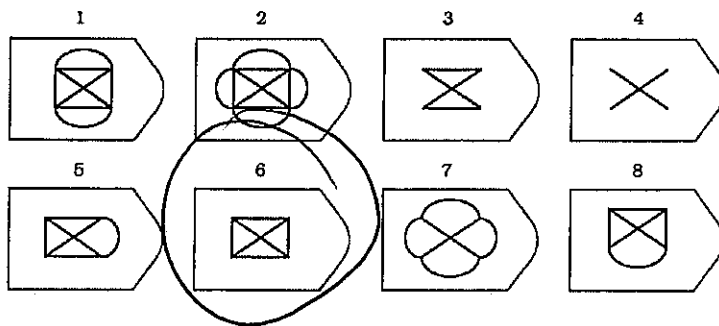
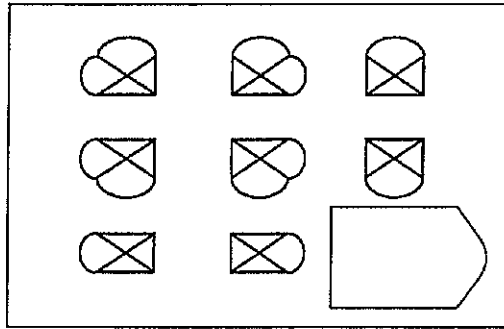
PATTERN 3



PATTERN 4



PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

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B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.

C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.

D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

A. Before the annual parade, the city council decided to renovate one of the buildings downtown.

B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.

C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.

D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

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B. Allison took her pedigree border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.

C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.

D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

A. The toddler wrote on the walls with pens when the babysitter wasn't looking.

B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.

C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.

D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
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-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
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- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- ☒ A. Getting the flu. They are similar because they are both caused by viruses.
- B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 21 years

What is your home zip code? 60091

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☒ Caucasian
☐ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☐ Other

STUDENT NAME: A44266728
Version A

GROUP: C30

19

MULTIPLE-CHOICE. 5 points each (50 points total).

- D 1. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
- The magma becoming colder
 - Gas bubbles forming in the magma
 - The surrounding crust becoming hotter
 - ☒ Crystals forming in the magma
- A 2. Which of the following would be considered a negative feedback to increasing global temperature?
- ☒ Melting of ice sheets resulting in more visible energy from the Sun being absorbed
 - Melting of permafrost resulting in more methane escaping into the atmosphere
 - An increase in evaporation and cloud formation resulting in the release of latent heat
 - An increase in desert formation resulting in more dusting blowing into the atmosphere
- C 3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
- A= erosion, B= deposition, C= uplift and erosion
 - A = erosion, B= biochemical precipitation, C= uplift and deposition
 - ☒ A= dissolution, B= biochemical precipitation, C= uplift and erosion
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- C 4. Which of the following statements about the greenhouse effect on Earth is most accurate?
- Human activities are the primary cause of the greenhouse effect.
 - Natural processes are the primary cause of the greenhouse effect.
 - ☒ Human activities and natural processes are roughly equal causes of the greenhouse effect.
 - Neither human activities nor natural processes are important causes of the greenhouse effect.
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5. Which of the following would cause the acidity of Earth's oceans to decrease?
- An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
 - A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
 - ☒ A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.
- B 6. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
- Reservoir A has a shorter residence time than Reservoir B.
 - ☒ Reservoir B has a shorter residence time than Reservoir A.
 - Reservoir A and Reservoir B have equal residence times.
 - More information about Reservoir A and Reservoir B is needed.

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

2

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?

- a. The reservoir will eventually disappear.
- b. The reservoir is not in equilibrium.
- c. The reservoir is growing smaller.
- d. The reservoir's residence time is 10 years.

8. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?

- a. Reflection of more solar radiation, causing atmospheric temperature to decrease
- b. Reflection of more solar radiation, causing atmospheric temperature to increase
- c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
- d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease

9. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?

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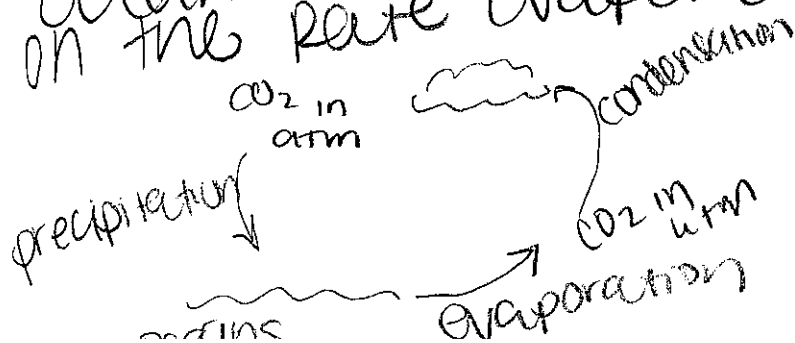
SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

Atmospheric carbon dioxide will increase if there is an increase in temperature. If there is an increase in temperature there will be more evaporation. Once evaporation increases so will precipitation. These are positive feedback loops because one thing causes another thing to change. Then there is the more precipitation atmosphere will fall into the ocean. Therefore, causing to be an increase in ocean acidification. However, there can be a negative feedback to that where because evaporation is increase it can also cause the amount of ocean acidification depending on the rate evaporation occurs.



1

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

? Mountains occurs when there is an increase in atmospheric temperatures. These mountains can then form volcanism on Earth. An increase in temperature will increase the amount of greenhouse gases in the atmosphere. Since the temperature will increase the amount of solar radiation absorbed decreases. The greenhouse gas aren't able to be trapped as long and are then released back into the atmosphere. The less solar radiation is absorbed the more heat is being reflected off causing the atmospheric temperatures to increase.

1

2

Extra crédit (2 points).

How are evaporation and degassing similar and/or different?

Evaporation is the heating of a liquid that causes it turn into a gas phase. Degassing is the movement of gases from one reservoir to next. They are similar in the sense that they both involve gases moving from one reservoir to another.

Earn up to 1 additional point on your course grade

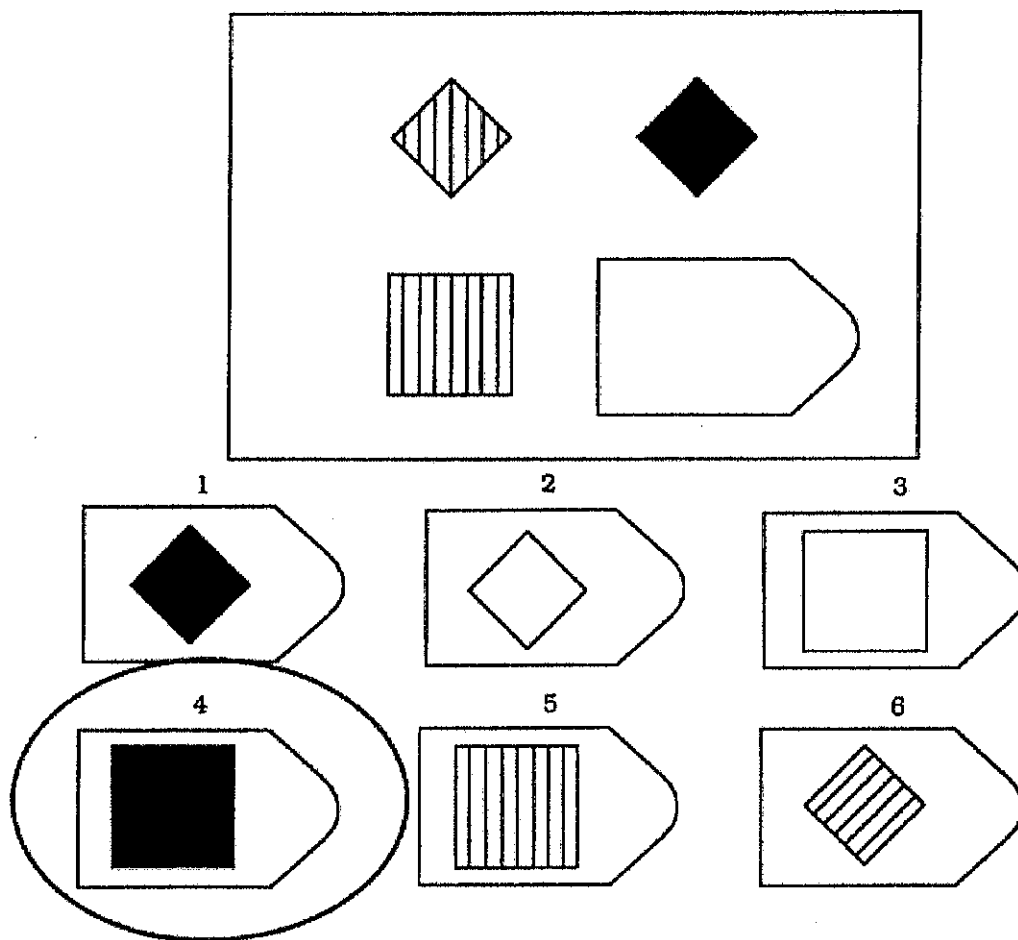
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

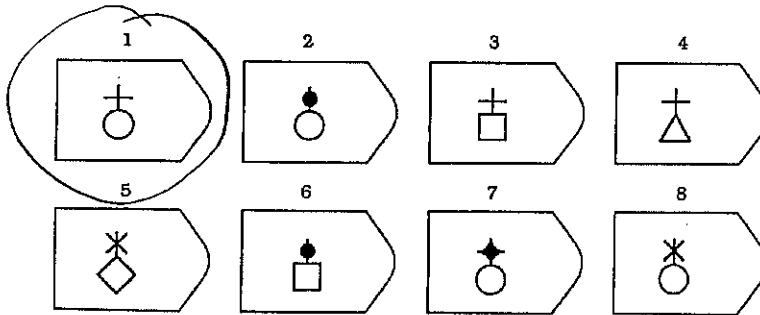
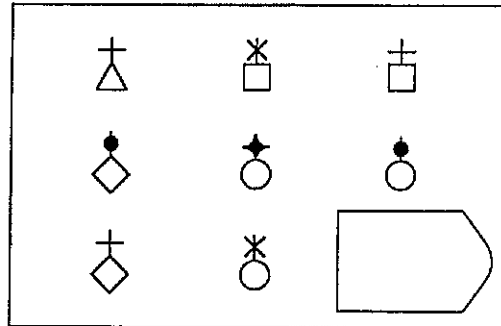


Answer: 4

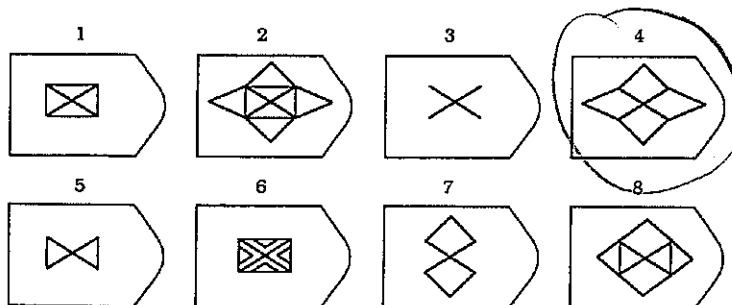
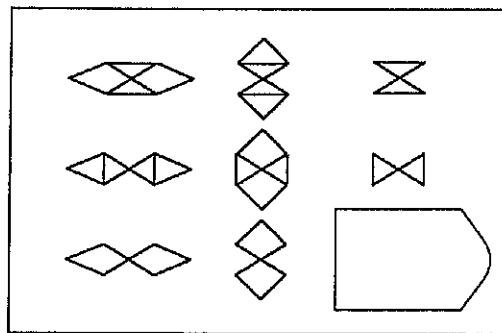
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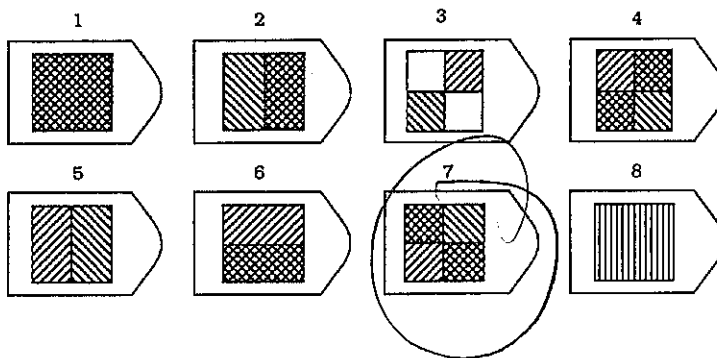
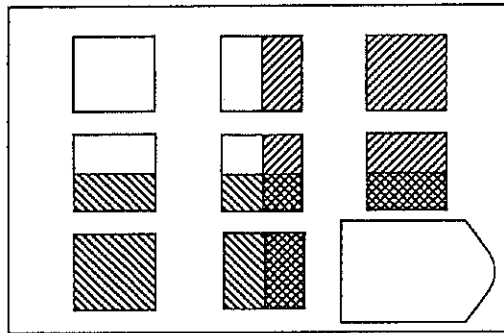
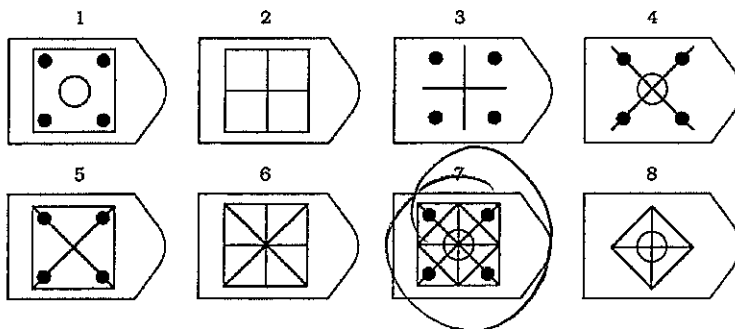
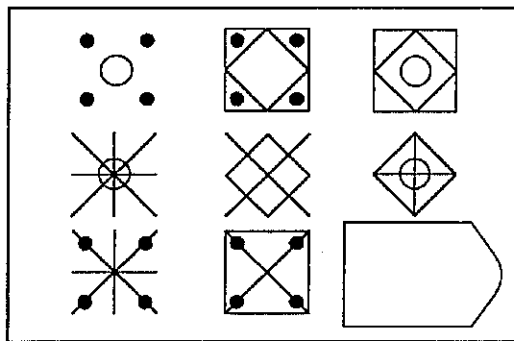
Please choose the image that best completes each of the following patterns.

PATTERN 1

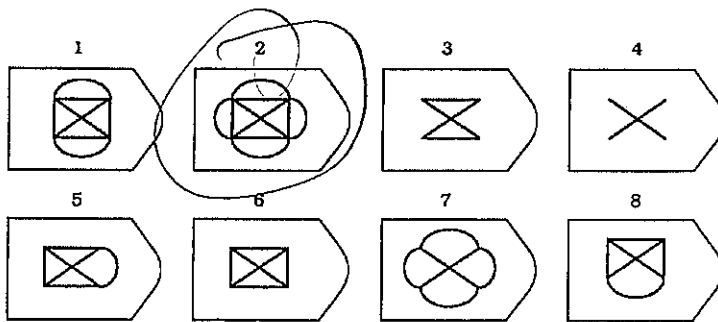
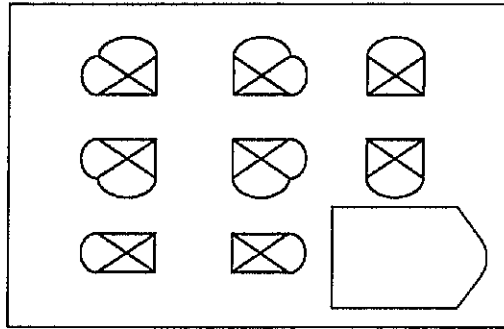


PATTERN 2



PATTERN 3**PATTERN 4**

PLEASE CONTINUE ON NEXT PAGE

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. The thieves knew that the driver would only be in the restroom for a short time, so they worked quickly to pick the lock on the armored car.

A. The experienced locksmith did not need much time to remove the padlock that no longer had a key.

B. Tommy knew that his parents would be angry, so he hacked into the school's database and changed his grades.

C. When John noticed that the guest speaker was free for a minute, he hurried over to talk to him and ask advice.

☒ D. Prometheus stole fire from the top of Mt. Olympus and brought it to mankind, allowing great advances in human civilization.

2. After only a week of vegetarianism, George relapsed into his prior meat-eating habits.

A. Before the annual parade, the city council decided to renovate one of the buildings downtown.

B. During a visit to the doctor, Emily was informed that she must take more vitamins to continue her vegetarian diet.

C. Despite requests from her family, Lisa continued to overwork herself with long hours at the lab.

☒ D. Even though her New Year's resolution was to spend less time on Facebook, by February Anna was again logging onto Facebook every five minutes.

3. The surveillance aircraft returned to its base with photographs and intelligence for the country's leaders, allowing a critical defense strategy to be set up.

A. The lioness came back after the hunt and brought freshly killed meat to her cubs, satisfying their growing need for food.

B. Allison took her pedigreed border collie to the professional groomer, and ensured that the collie would be looking its best at the dog show.

C. Joan returned home from work with some takeout from an Indian restaurant, but her kids had already eaten.

☒ D. The spy amassed hundreds of photos of the enemy's weapons production plant, and still nothing could be done to stop them from developing nuclear weapons.

4. The rival gangs used graffiti to define their territorial boundaries.

A. The toddler wrote on the walls with pens when the babysitter wasn't looking.

B. Artists were commissioned to paint murals on the sides of old buildings in an effort to beautify the city.

C. The cat rubbed against the new sofa, marking it with her scent and claiming it as her property.

☒ D. The government that was installed after the coup proved to be very unstable, and soon the original regime was back in control of the country.

PLEASE CONTINUE ON NEXT PAGE

5. The father repaired his daughter's toy, since he had been the one who accidentally stepped on it.
- A. The plumber fixed the pump that had burst and flooded the basement.
 - B. Steven avoided midweek outings in order to have the time for a weekend trip out of town
 - C. The groom's mother mended her son's tuxedo since he had torn a hole in it.
 - ☒ D. The supplier realized that he had failed to make an important shipment, and immediately sent it Federal Express at his own expense.
-

Please choose the response that is closest to an analogy that you might make.

1. A balloon floating is like...

- ☒ A. An ice cube in water. They are similar because they both are less dense than the surrounding material.
- B. A leaf in the air. They are similar because they both move through the air carried by the wind.
- C. Blowing bubbles. They are similar because they both float until they eventually pop.
- D. A cloud in the sky. They are similar because they both float and are carried by the wind.

2. Catching a cold is like...

- A. Getting the flu. They are similar because they are both caused by viruses.
- ☒ B. Getting pink eye. They are similar because they are both contagious.
- C. Getting the flu. They are similar because they are both caused by not washing your hands.
- D. Forgetting to do your homework. They are similar because they are both preventable.
- E. Not getting enough sleep. They are similar because they both involve a weakened immune system.

DEMOGRAPHICS

What is your age? 19 years

What is your home zip code? 33012

What is your gender?

☐ Male
☒ Female
☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

☐ African American/Black
☐ Caucasian
☒ Latino/Hispanic
☐ Native Hawaiian/Pacific Islander
☐ Native American
☐ Other

1

ISP 203A: GLOBAL CHANGE
FINAL EXAM; Sibley/Libarkin, Spring 2011; 100 points

STUDENT NAME: A42894705
Version B

GROUP

C30

55

MULTIPLE-CHOICE. 5 points each (50 points total).

1. Which of the following would be considered a negative feedback to increasing global temperature?
a. Melting of ice sheets resulting in more visible energy from the Sun being absorbed
C b. Melting of permafrost resulting in more methane escaping into the atmosphere
C c. An increase in evaporation and cloud formation resulting in the release of latent heat
d. An increase in desert formation resulting in more dusting blowing into the atmosphere
2. Which of the following changes would cause a rising magma to increase the rate at which it rises toward the surface?
a. The magma becoming colder
B b. Gas bubbles forming in the magma
c. The surrounding crust becoming hotter
d. Crystals forming in the magma
3. Fill in the blanks. Calcium atoms in a limestone at Earth's surface become calcium atoms in solution through the process of A. Eventually, these same atoms reach the ocean where they become a part of crystalline limestone through the process of B and compaction, and then limestone becomes exposed at Earth's surface through the processes of C.
C a. A= erosion, B= deposition, C= uplift and erosion
b. A = erosion, B= biochemical precipitation, C= uplift and deposition
C c. A= dissolution, B= biochemical precipitation, C= uplift and erosion
d. A = dissolution, B= deposition, C= uplift and deposition
4. Which of the following statements about the greenhouse effect on Earth is most accurate?
a. Human activities are the primary cause of the greenhouse effect.
B b. Natural processes are the primary cause of the greenhouse effect.
c. Human activities and natural processes are roughly equal causes of the greenhouse effect.
d. Neither human activities nor natural processes are important causes of the greenhouse effect.
e. The human and natural causes of the greenhouse effect are not understood.
5. Imagine two CO₂ reservoirs. Reservoir A is twice the size of Reservoir B. In both Reservoirs A and B, CO₂ influx and CO₂ outflow are equal. Which reservoir has the shorter residence time?
B a. Reservoir A has a shorter residence time than Reservoir B.
B b. Reservoir B has a shorter residence time than Reservoir A.
c. Reservoir A and Reservoir B have equal residence times.
d. More information about Reservoir A and Reservoir B is needed.
6. Which of the following would cause the acidity of Earth's oceans to decrease?
a. An increase in ocean temperature due to an increase in atmospheric carbon dioxide.
B b. A decrease in ocean temperature due to blocking of solar radiation by volcanic ash.
c. A decrease in ocean temperature due to a decrease in solar radiation emitted by the Sun.

7. A reservoir is 1000 km^3 in size, has an influx of $100 \text{ km}^3/\text{year}$ and an outflow of $50 \text{ km}^3/\text{year}$. Which of the following statements is true?
- a. The reservoir will eventually disappear.
 - ☒ b. The reservoir is not in equilibrium.
 - c. The reservoir is growing smaller.
 - d. The reservoir's residence time is 10 years.
8. What would happen to Earth's atmospheric temperature if the countries of the world limited human-caused greenhouse gas emissions to 1990 rates?
- ☒ a. The Earth's atmosphere would become colder than it is today.
 - ☐ b. The Earth's atmosphere would become warmer than it is today.
 - c. The Earth's atmosphere would remain about the same temperature as it is today.
 - d. The role of positive and negative feedbacks makes it impossible to determine if Earth's atmospheric temperature would increase, decrease, or remain the same.
9. Imagine the Earth's atmospheric temperature is decreasing. This decrease in temperature will cause glaciers to form. What will be the effect of glacial formation?
- ☒ a. Reflection of more solar radiation, causing atmospheric temperature to decrease
 - ☐ b. Reflection of more solar radiation, causing atmospheric temperature to increase
 - c. Re-emitting of more infrared radiation, causing atmospheric temperature to increase
 - d. Re-emitting of more infrared radiation, causing atmospheric temperature to decrease
10. Imagine that Earth's atmospheric temperature is increasing. This causes more evaporation and therefore the formation of more clouds. Which of the following statements is true?
- a. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a positive feedback to Earth's atmospheric temperature.
 - ☒ b. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a positive feedback to Earth's atmospheric temperature.
 - c. Less energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go down. This is a negative feedback to Earth's atmospheric temperature.
 - ☒ d. More energy will be released during cloud formation, and therefore Earth's atmospheric temperature will go up. This is a negative feedback to Earth's atmospheric temperature.

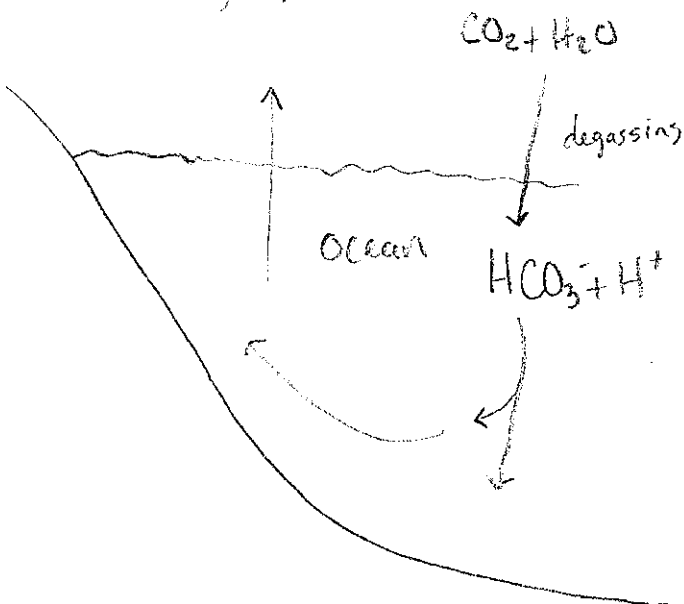
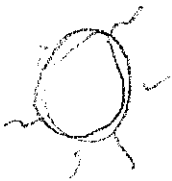
SHORT ANSWER. 25 points each (50 points total)

1. How would an increase in atmospheric carbon dioxide affect ocean acidification?

Your answer should include:

- An explanation of the process of ocean acidification. You may draw a diagram, explain the process in words, or both. This equation may be helpful: $\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{HCO}_3^- + \text{H}^+$
- Discussion of both negative and positive feedback loops to the process of ocean acidification.

An increase in atmospheric carbon dioxide would increase ocean acidification. The increase of atmospheric carbon dioxide means there will also be an increase in hydrospheric carbon dioxide because more carbon dioxide will move from the atmosphere to the hydrosphere through the process of degassing. Ocean acidification is increased when more carbon dioxide enters the ocean. More carbon dioxide entering the ocean is positive feedback, where as carbon dioxide leaving the ocean is negative feedback.



18

2. Imagine volcanism on Earth suddenly increases dramatically, particularly volcanoes that erupt large ash clouds. How would this increase in volcanism affect Earth's atmospheric temperature?

Your answer should include:

- An explanation of all processes related to volcanism that influence atmospheric temperature. This will include an explanation of the greenhouse effect.
- Clear connections between events and changes in atmospheric temperature.

An increase in volcanism would decrease Earth's atmospheric temperature. The volcanic ash would get into the atmosphere and suspend there. This ash in the atmosphere would block much of the sun's infrared and UV rays. ^{OK} The ash would trap the rays a bit like the greenhouse effect which traps infrared heat on earth; the only difference is that the sun's rays wouldn't reflect [?] of the earth's surface. So the earth's temperature would decrease. Volcanism has occurred before and it presents troubles for the areas around it. When Mt. St. Helens erupted there was too much ash in the atmosphere to fly commercially and temperature decreased around the area, including lack of sunlight.

2

P

Extra credit (2 points).

How are evaporation and degassing similar and/or different?

They both involve the liquid and gas states.

Evaporation moves from a liquid to a gas. Degassing moves from a gas to a liquid.

Earn up to 1 additional point on your course grade

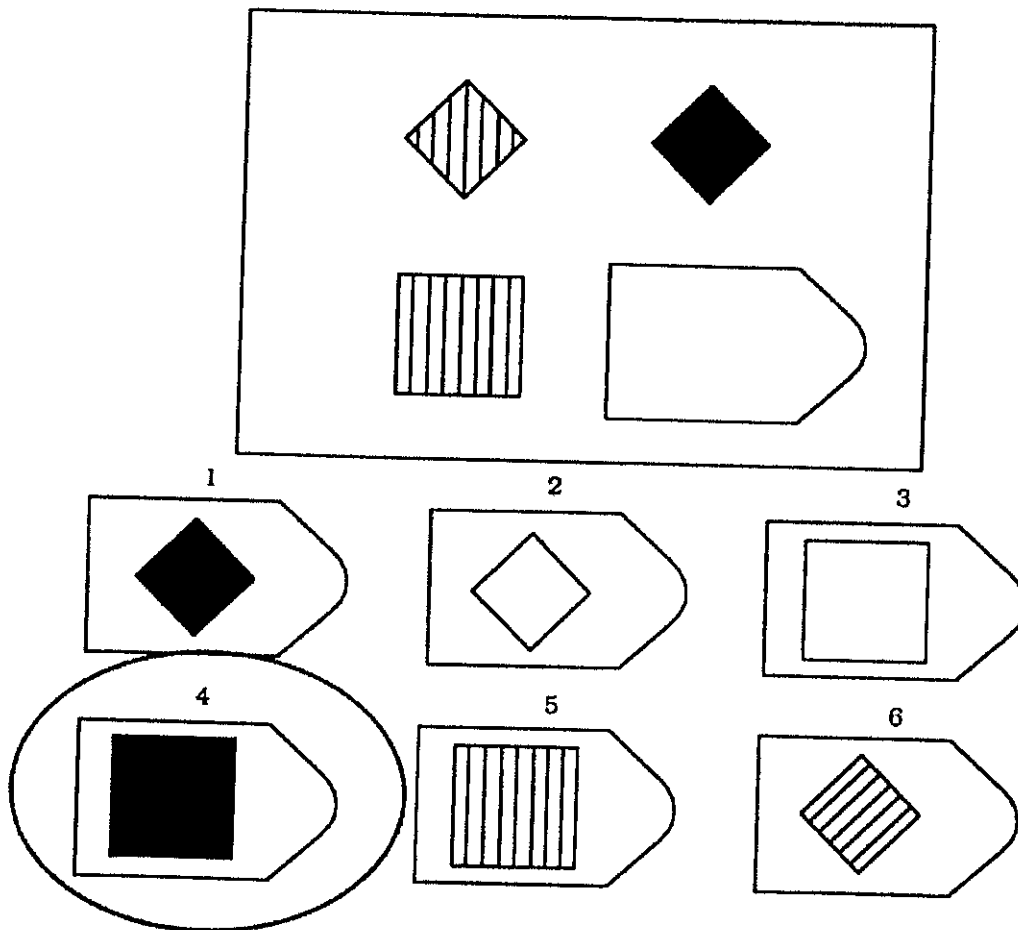
[ex. a 79% becomes an 80%]

Thoughtfully complete the attached survey

Analogical Assessment

In this exercise, you will be asked to solve a set of visual problems. In each problem, you will see a set of images that form a pattern. However, one image will be missing. You must choose the image that best completes the pattern.

Example

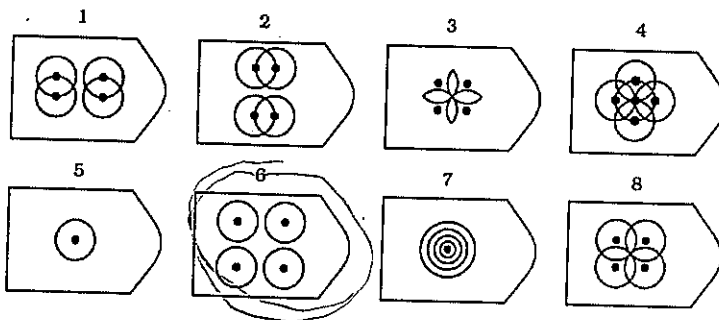
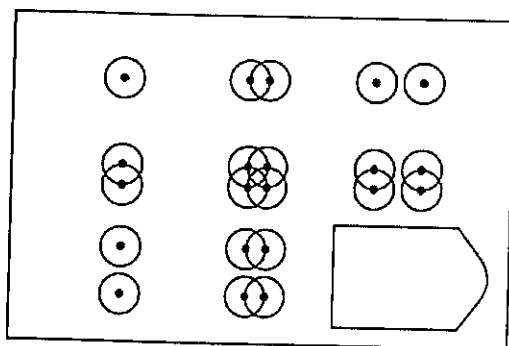


Answer: 4

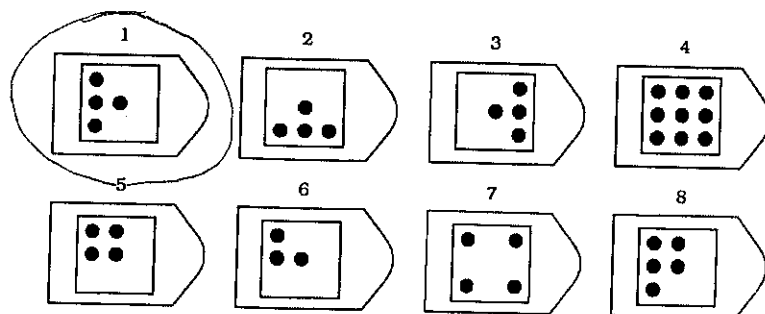
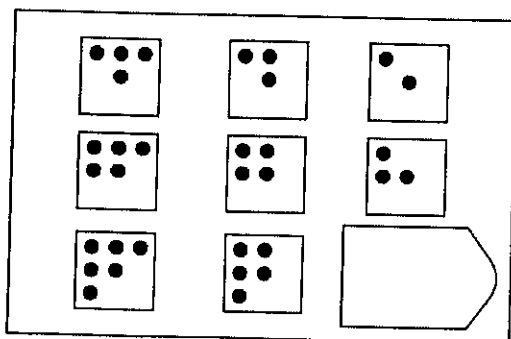
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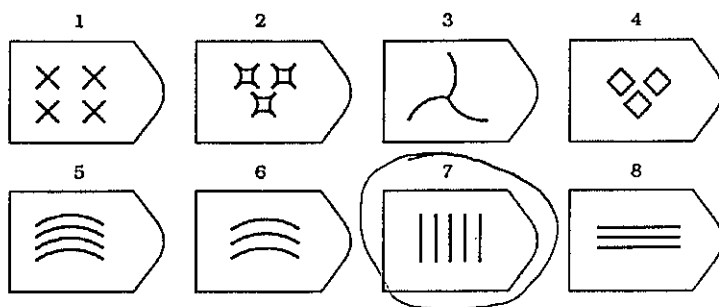
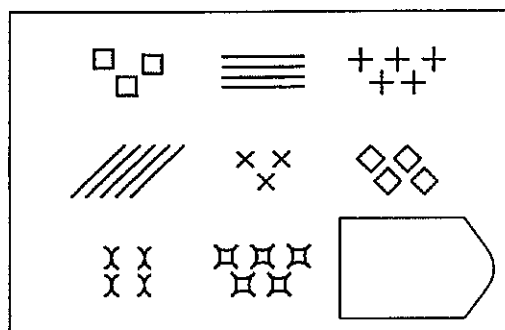
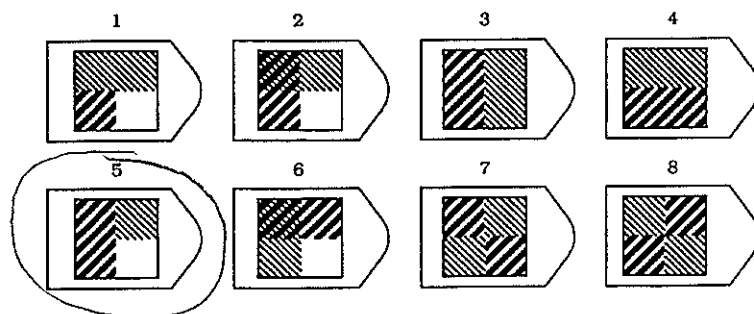
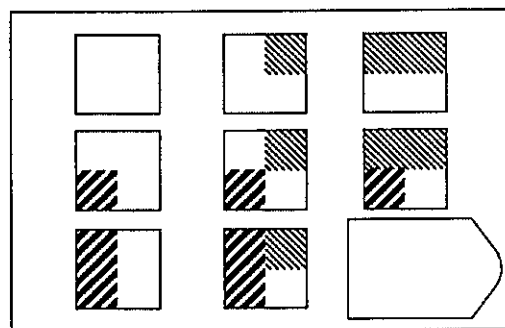
PATTERN 1

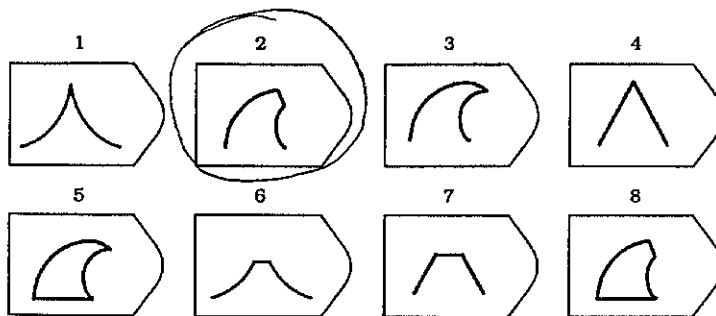
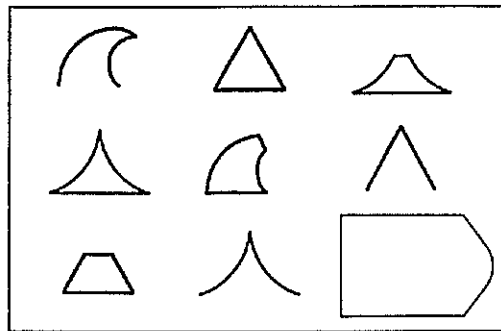


PATTERN 2



PLEASE CONTINUE ON NEXT PAGE

PATTERN 3**PATTERN 4**

PATTERN 5

In this next exercise you will be presented with a base statement and three answer statements. The object of this exercise is to match the base statement with an answer statement that is the best analogy to the base.

Example

Base: Several pit stops during the race gave the car a chance to refuel and receive minor adjustments.

- A. While migrating south for the winter months, the flock of geese would frequently stop near bodies of water for rest and rehydration.
- ☒ B. Once the couple had finished putting together their new entertainment center, the rest of the afternoon was spent rearranging furniture to accommodate it.
- C. The car manufacturer decided to discontinue the model after research showed the faulty mechanism could have serious consequences.

PLEASE CONTINUE ON NEXT PAGE

Please choose the best analogy to each of the following statements.

1. While testing a computer security system, the computer scientist accidentally released a destructive virus onto the internet.

- B ☐ A. While debugging their broken firewall, a programmer came across top-secret CIA files.
- ☒ B. As the zoo keeper entered the habitat for cleaning, a wild tiger was able to escape into a local neighborhood.
- ☐ C. After realizing that many of their vehicles had been manufactured with faulty brakes, an automobile company issued a nationwide recall.
- ☐ D. When he realized that the public statement he had made might have been misleading, the politician went to great lengths to publicly correct any misconceptions.

2. In response to an embarrassing defeat, the volleyball coach scheduled several additional practices for the following week

- ☒ A. Alan did badly on the first exam for one of his classes, so he decided to put in several extra hours of study.
- A ☐ B. Dan noticed a short break in the rainstorm, and made a dash from his building to the train station.
- ☐ C. Jim's band has their first big gig next week, so they rehearsed for 10 hours straight on Saturday.
- ☐ D. Some members of the basketball team suffered injuries on a ski trip, so they are spending many hours with the team physical therapist.

3. The couple saved for a fancy anniversary dinner by eating cheaply for the week beforehand.

- ☐ A. Joe had easier access to his recipes by consolidating his most frequently used recipes into a single binder.
- ☐ B. Bob was able to maximize his work time by cutting back on watching TV during the day.
- D ☐ C. Sean has been closely monitoring his eating in an attempt to improve his diet.
- ☒ D. Mary opted not to take a "sick day" so that she would be able to have a longer Christmas vacation.

4. When she saw the menacing clouds, Margaret returned to her apartment to get an umbrella.

- ☐ A. After eating a big lunch, Dan went back to his office and took a nap.
- ☐ B. When the debate went badly, Ann decided to put more time into developing convincing arguments.
- C ☒ C. Once he saw everyone else's formal suits, Dan went home to change clothes.
- ☐ D. When she heard the forecast, Jen became concerned about her plans for the weekend.

PLEASE CONTINUE ON NEXT PAGE

5. Due to an especially high drop rate that quarter, the administration decided to combine students from two introductory psychology courses into a single class.

- ☒ A. Because of low traffic volume, some of the underused outbound lanes of traffic are closed down in the morning.
- ☐ B. Because the course content for 'Literature of Eastern Europe' and 'Russian Literature' was highly similar, the administration decided to combine the courses and create a Slavic literature course.
- ☐ C. Because so many members of the Des Plaines Teamsters had left the union, their local branch disbanded.
- ☐ D. On the basis of new information, the police officer revisited the crime scene to look for new evidence.
-

Please choose the response that is closest to an analogy that you might make.

1. Getting drunk is like...

- ☒ A. Getting high. They are both involve too much of a chemical influencing the body.
- ☐ B. Hitting your head. They both involve something that causes headaches.
- ☐ C. Being sleep deprived. They both involve impaired functions.
- ☐ D. Eating too much candy. They both involve lack of self-control.
- ☐ E. Sleeping late. They are both caused by lack of self-control.

2. Water freezing is like...

- ☐ A. Dew forming. They are similar because they both involve a drop in temperature.
- ☐ B. Blowing up a balloon. They are similar because they both involve becoming less dense.
- ☒ C. Clouds forming. They are similar because they both involve a phase change.
- ☐ D. Building a house. They are similar because they both involve building a structure.

DEMOGRAPHICS

What is your age? 18 years

What is your home zip code? 48801

What is your gender?

- ☒ Male
- ☐ Female
- ☐ Transgender

What is your ethnicity? CHOOSE ALL THAT APPLY.

- ☐ African American/Black
- ☒ Caucasian
- ☐ Latino/Hispanic
- ☐ Native Hawaiian/Pacific Islander
- ☐ Native American
- ☐ Other